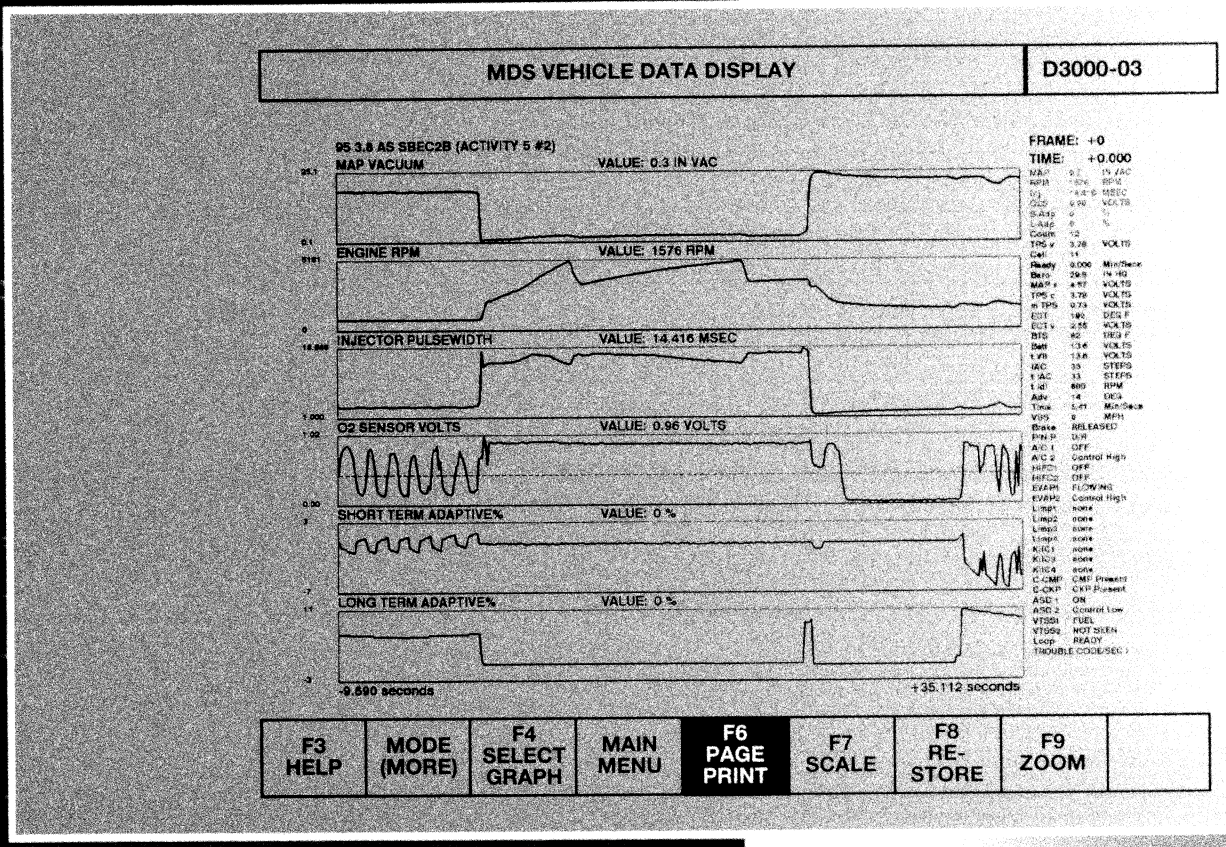
STUDENT WORKBOOK

Fuel Injection Data Recording Creation & Interpretation



TRAINING

CHRYSLER CORPORATION

CUSTOMER SATISFACTION & VEHICLE QUALITY

SAFETY NOTICE

This publications purpose is to provide Technical training information to individuals in the automotive trade. All test and repair procedures must be performed in accordance with manufacturers service and diagnostic manuals. All ***warnings, cautions,*** and ***notes*** must be observed for safety reasons. The following is a list of general guidelines:

- Proper service and repair is critical to the safe, reliable operation of all motor vehicles.
- The information in this publication has been developed for service personnel, and can help when diagnosing and performing vehicle repairs.
- Some service procedures require the use of special tools. These special tools must be used as recommended throughout this Technical Training Publication, the diagnostic Manual, and the Service Manual.
- Special attention should be exercised when working with spring-or tension-loaded fasteners and devices such as E-Clips, Cir-clips, Snap rings, etc., careless removal may cause personal injury.
- Always wear safety goggles when working on vehicles or vehicle components.
- Improper service methods may damage the vehicle or render it unsafe.
- Observe all *warnings* to avoid the risk of personal injury.
- Observe all *cautions* to avoid damage to equipment and vehicle.
- *Notes* are intended to add clarity and should help make your job easier.

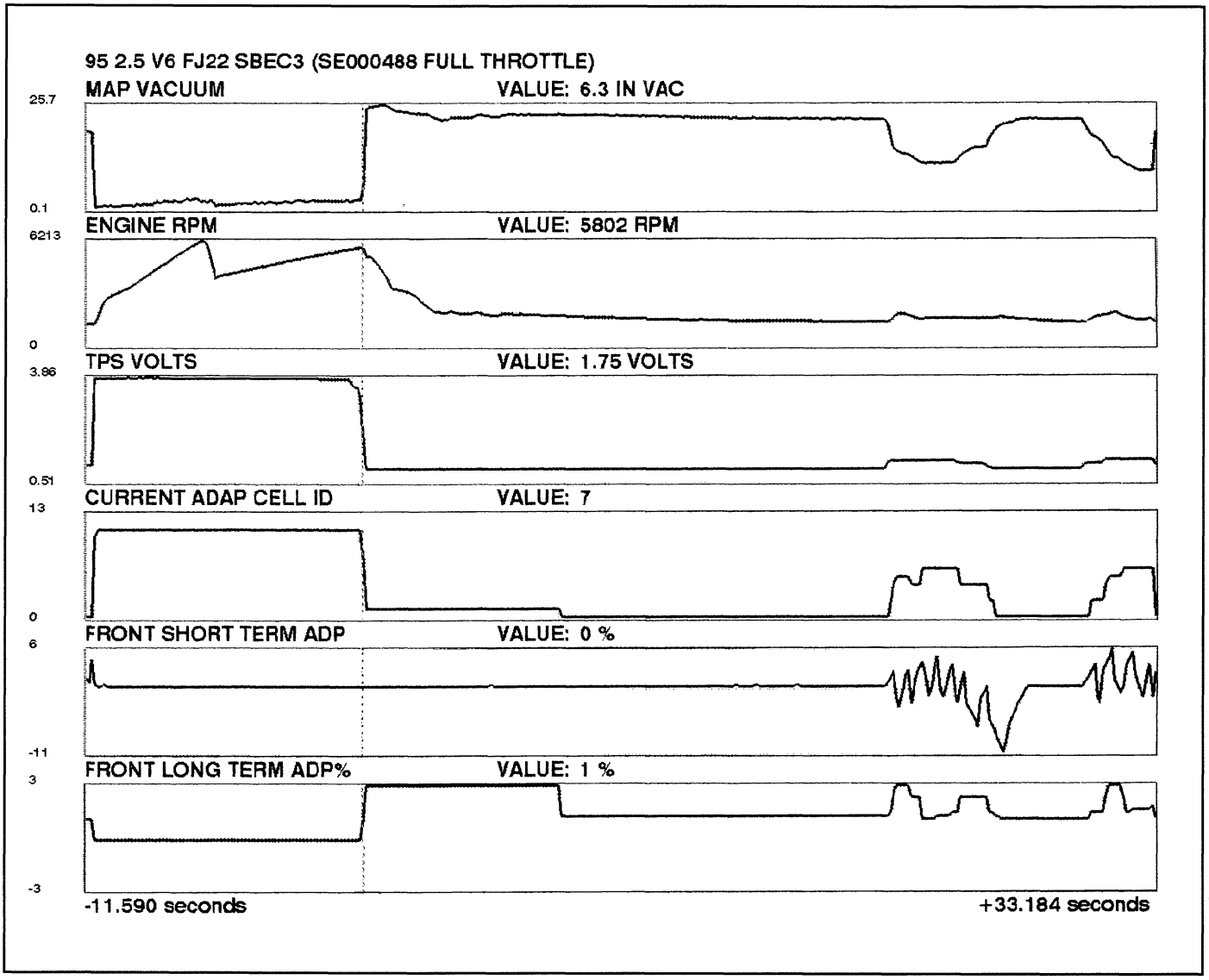
Cautions and *Warnings* cover only the situations and procedures Chrysler Corporation has encountered and recommended. Chrysler Corporation cannot know, evaluate, and advise the service trade of all conceivable ways in which service may be performed, or of the possible hazards or each. Consequently, Chrysler Corporation has not undertaken any such broad service review. Accordingly, anyone who used a service procedure or tool that is not recommended in this publication, must be certain that neither personal safety, nor vehicle safety, is jeopardized by the service methods they select.

TECHNICAL TRAINING

CustomerOne™

MASTER TECH

Fuel Injection Data Recording



Fuel Injection Data Recording

TABLE OF CONTENTS

Fuel Injection Data Recording

INTRODUCTION

The Data Recorder is a technologically advanced function, designed to aid Chrysler dealer technicians in diagnosis of driveability problems, which only happen under road load conditions, or those problems which don't happen often enough to be easily diagnosed. The Data Recorder won't be needed for every vehicle, but for vehicles requiring advanced diagnostics on intermittent problems, it is the best tool available.

STUDENT LEARNING OBJECTIVES

Upon completion of this course, you should be able to:

1. The Technician will be able to retrieve, properly identify and store a set of events with 100% accuracy.

2. The Technician will be able to display and manipulate a stored set of events with 100% accuracy.

3. The Technician will be able to interpret a set of events leading to the successful diagnosis of a problem/DTC or an operating condition with 100% accuracy.

4. The Technician will be able to make a template for the provided vehicle with 100% accuracy.

5. The Technician will be able to demonstrate knowledge of custom triggers by making a recording when a specific condition occurs.

6. The Technician will be able to make a custom template and load it into a DRB.

LESSON ONE

INTRODUCTION TO DATA RECORDER

The data recorder provides the ability to record events eight times faster than the DRB can look at them while in scan tool mode. If a custom template is made, with 5 sensors or switches, the data recorder will be able to interview those items at PCM real time.

A data recording is 45 seconds long. If a recording does not show a time of 45 seconds then a power interrupt was experienced.

When the data recording is displayed, size items will be graphed. The remainder of the items that were recorded are listed on the right side of the graph.

The Co-Pilot has four tracks that it can make recordings on. Depending on how many events have been recorded the Co-Pilot may count the events in one of the following combinations:

- 1,2,3
- 2,3,4
- 1,3,4
- 1,2,4

As can be seen the Co-Pilot always has one track erased and ready to record. When the numbers are in sequence the last recording is the highest number. However when the numbers are not in sequence the last recording is the highest number right before the gap. (Fig. 1)

Event Tracks	When using Co-Pilot the number sequence will change due to preparation for next rec.															
	Act.	View	Act.	View	Act.	View	Act.	View	Act.	View	Act.	View	Act.	View	Act.	View
A	1	1	1		5	1	5	1	5	1	5		9	1	9	1
B	2	2	2	2	2		6	2	6	2	6	2	6	2	10	2
C	3	3	3	3	3	3	3		7	3	7	3	7		7	
D			4	4	4	4	4	4	4		8	4	8	4	8	4

Fig. 1

Activity 1

RECORDING WITH CO-PILOT

Answer the following questions as you program the Co-pilot, make the recordings (events), and load the events into the MDS. Make the recording as discussed except as requested below. **Before beginning the questions select Diagnostics Menu from the "Diagnostic system main menu" ... "Data Recorder Functions" from the Diagnostic Main menu.** Not all of the necessary key presses are listed below. Read the first question and do enough of the procedure to find the answer. Continue this process until all questions are completed.

1. Using page A8 of the reference book, power up the Co-pilot. List the cable connections in order.
   1.
   2.
   3.

2. Using page A9 verify proper light function on the Co-pilot. It may be necessary to disconnect the power cable and plug it in again to do this. List the power up light sequence.
   1.
   2.

3. What is your next menu selection?

4. What key do you press to find out if your vehicle is listed as one of the vehicles MDS data recorder will work on?

5. How many characters or spaces can be used in the technician I.D.?

6. Type the first letter of the VIN wrong and finish typing the VIN. Now return and correct the VIN. What key did you use to return to that space in the VIN?

7. Next enter the R.O. #01993 and the current mileage on your vehicle and press next menu. What message is in the header bar of the next screen?

8. Is the year and engine size in the description column correct for the vehicle you are working on?

9. Does this template contain the items you want to record?

10. What are the next 2 steps MDS asks you to do?
    1.
    2.

11. Go over to the vehicle and make sure the key is _____ before hooking up the Co-pilot. Make 5 recordings. What does the light do on the remote control while Co-pilot is finishing the recording?

Activity 1

12. How long will the Co-pilot stay powered up after the key is turned off and all doors are shut on a vehicle that does not have a switched battery source to power the Co-pilot?

13. The first 3 steps in loading your recordings into MDS are to? (Refer to page A13 steps 2, 3, and 4.)
    1.
    2.
    3.

14. Before continuing what should you see on the Co-pilot?

15. What is your next selection?

16. How many events (recordings) does MDS show in the Co-pilot?

17. How are the events numbered?
    A) 1, 2, 3, 4
    B) 1, 2, 3
    C) 2, 3, 4
    D) 1, 3, 4

18. How many spaces (letters or numbers) can be used in the name of event?

19. Name 3 types of information that should be used to make up the event name.
    1.
    2.
    3.

20. In order to continue loading events, what key is used?

Activity 2

RECORDING WITH DRB III

Answer the following questions as you program the DRB III, make the recordings (events) and load the events into the MDS. Make the recordings as discussed except as requested below. **Before beginning the questions select "Diagnostics Menu" from the "Diagnostic system main menu," "Data Recorder Functions" from the Diagnostic Main menu."** Not all of the necessary key presses are listed below.

1. What is the power up sequence for DRB III?
   1.
   2.

2. The next step is to select a menu option from the DRB III main menu. What is its name?

3. What does the DRB III screen read when the DRB III is ready to continue?

4. What is your next menu selection?

5. What key do you press to find out if your vehicle is listed as one of the vehicles MDS data recorder will work on?

6. How many characters or spaces can be used in the technician I.D.?

7. Type the first letter of the VIN wrong and finish typing the VIN. Now return and correct the VIN. What key did you use to return to that space in the VIN?

8. Next enter the R.O. #01993 and the current mileage on your vehicle and press Page forward key on DRB III. What message is in the header bar of the next screen?

9. Is the year and engine size in the description column correct for the vehicle you are working on?

10. Does this Template contain the items you want to record?

11. What DRB III key did you press to actually program the DRB III?

12. Was it necessary to press any keys to return to the "Data Recorder Main menu"?

Activity 2

13. Go over to the vehicle and make sure the key is _____ before hooking up the DRB III.

14. Which DRB III adapter cable did you use when you attached DRB to the vehicle?
    A. CH7000/CH7001
    B. CH7020/CH7021
    C. CH 7015

15. How do you know the DRB III is finished powering up?

16. Once the DRB III is powered up what option must you select from the DRB III main menu to continue?

17. Is the VIN information correct?

18. Press the "more" key to see other options. What are they?
    1.
    2.
    3.

19. Select option #1. What keys did you press to change the "seconds after trigger" from 10 to 20 seconds?

20. What key is used to return to the Data Recorder Main menu?

21. How many times did you press this key to return to DRB III's Data Recorder Main Menu?

22. What keys must be pressed for event #1 to begin recording?

23. What key must be pressed to trigger an event?

24. Repeat this procedure for the remaining 3 events in this order 3, 2, 4. Is this possible?

25. From the DRB III Data recorder main menu again select the "other options" menu. What key did you press?

Activity 2

26. Choose option #2. Does the DRB III now display "select an event press 1, 2, 3, 4"?

27. Select an event by pressing the number. Is a list of data items displayed?

28. What is the key sequence to display a data item?
    1.
    2.

29. How do you return to the main menu?

30. Before unplugging DRB III what message should you see on the screen momentarily?

31. What is the power up sequence for DRB III? (You should be at the Data Recorder Main Menu)
    1.
    2.

32. What is your next menu selection on MDS?

33. Before making the selection named in the previous question, what option # should you choose from the DRB III main menu?

34. What does the screen read when DRB III is ready to continue?

35. Press the page forward key to select Get Vehicle Events from DRB or Co-pilot. How many events (recordings) does MDS show in the DRB III?

36. How are the events numbered?
    A. 1, 2, 3, 4
    B. 1, 2, 3
    C. 2, 3, 4
    D. 1, 3, 4

37. How many spaces (letters or numbers) can be used in the name of an event?

38. Name 3 types of information that should be used to make up the event name.
    1.
    2.
    3.

Activity 3

MANIPULATING DATA RECORDER GRAPHS

To answer the following questions you will need to display a data recording named Activity 4. While displaying the graph, make the necessary changes to answer the questions below. **To begin the questions select Diagnostics Menu from the Diagnostic system main menu; Data Recorder Functions from the Diagnostic main menu.** Not all of the necessary key presses are listed in the following steps.

1. Did you find the recording named Activity 3?

2. Reset the recording to display in the following order Barometric pressure, MAP volts, Right Injector Bank PW, Right Bank O^2, Left Injector Bank PW and Left Bank O^2 as graphs. Which graph is a straight line?

3. Move the cursor to find the lowest MAP voltage. What is the coolant temperature listed at the side of the graph?

Next display coolant temperature as a graph in place of MAP volts. Continue by changing coolant temperature and barometric pressure to Full scale.

4. What is the maximum range for the coolant temperature graph?

5. What is the maximum range for the barometric pressure graph?

Next with coolant temperature as a graph in place of MAP volts, continue by changing coolant temperature and barometric pressure to Automatic scale.

6. What is the maximum range for the coolant temperature graph?

7. What is the maximum range for the barometric pressure graph?

Zoom the area where Right Bank Injector PW drops to 1.024ms.

8. What does this function do?

9. What key do you push to leave the zoom function and return to the graph without returning to the index or the original set of graphs?

10. Restore the graph to its original set of graphs. What key did you push?

11. Graph the following switches S.C. On, Set, Brake, S.C. Vacuum solenoid, S.C. Vent solenoid. did they all fit in one graph?

12. Did any of the switches change state in the recording?

LESSON THREE

INTERPRETING DATA RECORDINGS

METHOD OF APPROACH TO INTERPRETING DATA RECORDINGS

- Can the condition shown really exist?
  - Can the coolant temperature drop 100°F and climb back up in 5 seconds?
  - Can vertical changes in MAP vacuum actually happen?
    - Pull up voltage
    - Pull up trouble codes
  - Can engine change 2000 RPM in one frame of recording?
- If it can exist, prove it by finding two other indicators that will support the reading
  - For example: TPS is at 3.97 volts
    - This indicates WOT
    - MAP should show a drop
    - Engine RPM should be increasing
- Look at the texture of the line under investigation
  - Do the textures of the supporting graphs match
    - If TPS is real erratic MAP should be also
    - If TPS is real erratic there should be abnormal spikes in the injector graph
  - Is the condition normal, what are the operating conditions?
    - When the transmission shifts during an acceleration under steady throttle
      - Engine RPM ratio to vehicle speed changes
      - MAP should change while TPS remains steady
    - At WOT
      - O2 sensor volts change from switching to steady high
      - MAP drops suddenly low
      - Engine RPM should ramp up until shifts occur or throttle is released
- Line characteristics - things to note
  - Since a graph line is a time line, vertical changes indicate changes that MAY be to fast to be physically possible.
  - When a line changes direction pay attention to the way it makes the turn.
    - Is the point sharp or rounded ?
    - Does the inside angle vary or remain constant ?
    - Does the amplitude of the line pattern remain the same, change randomly or repeat ?

- Sensor Failure - open circuit connections (Fig. 2)
  - Open MAP Signal Wire
    - Voltage goes up
    - At first open circuit, MAP value does a vertical movement (is this possible as a normal condition?)
    - At second open circuit the MAP value does not move vertically because a limp in value was in place due to a secondary indicator for MAP
      - Graphs containing sensor values may be displaying calculated values due to sensor failure.
        - Limp in faults use calculated values
    - Graphed sensor voltage will show the true condition of the sensor signal.

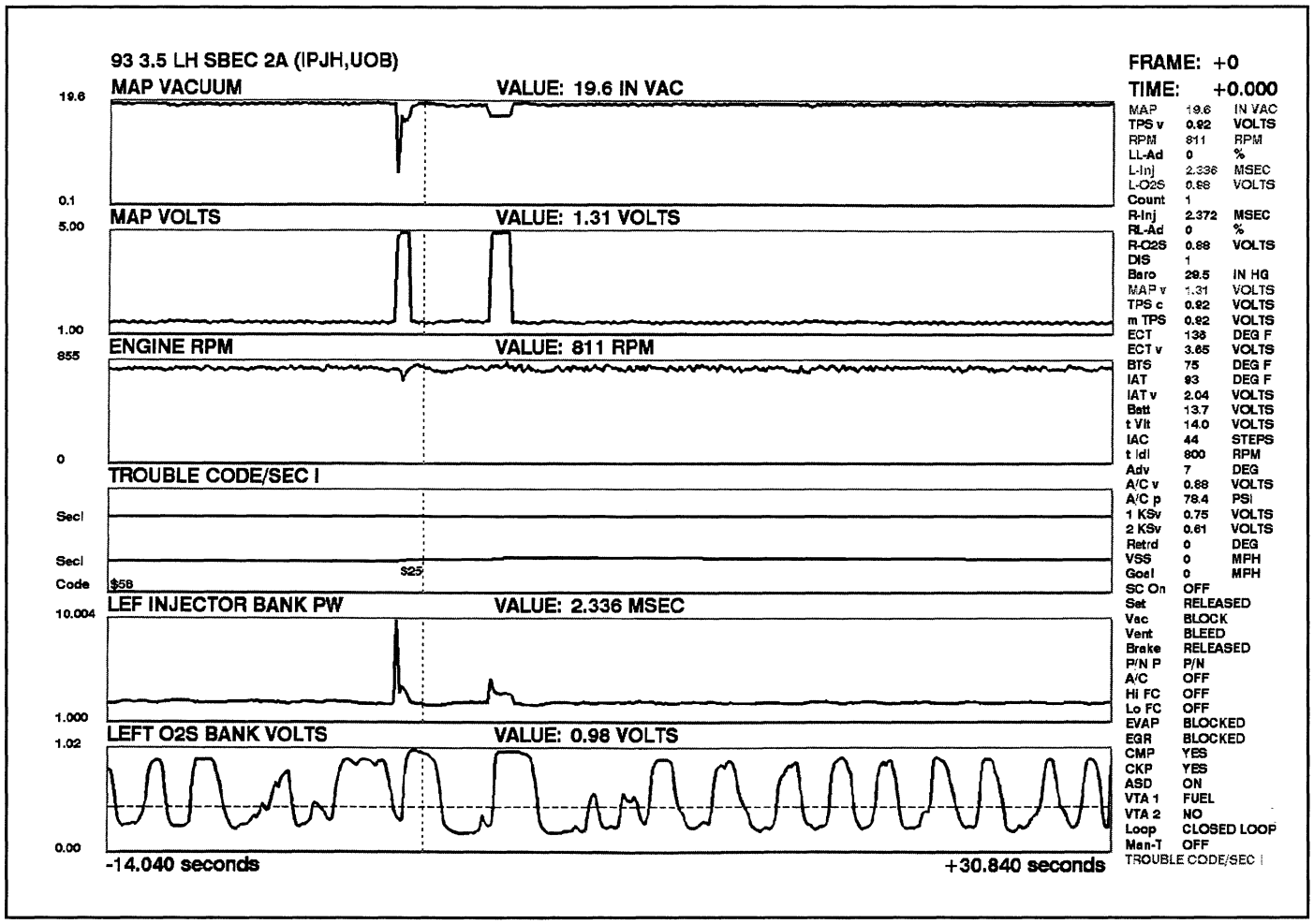


Fig. 2

Fuel Injection Data Recording

- Reference Fig. 3 for the following examples.

Example: A cylinder miss will cause the rpm line pattern to have sharp points, relatively constant inside angle, and maintain the same amplitude.

Example: An EGR valve that is open when it should not be will exhibit the following characteristics:

1. The amplitude of the rpm line increases or decreases (varies) from one peak to the next.
2. The inside angle is also variable.
3. The points are sharp.

This process of analyzing the line should be applied to all sensor graphs. Although the process is the same for all sensors, each sensor is different; so — it should be remembered that the line tells us
about that sensor and the physical condition it is converting to an electrical signature.

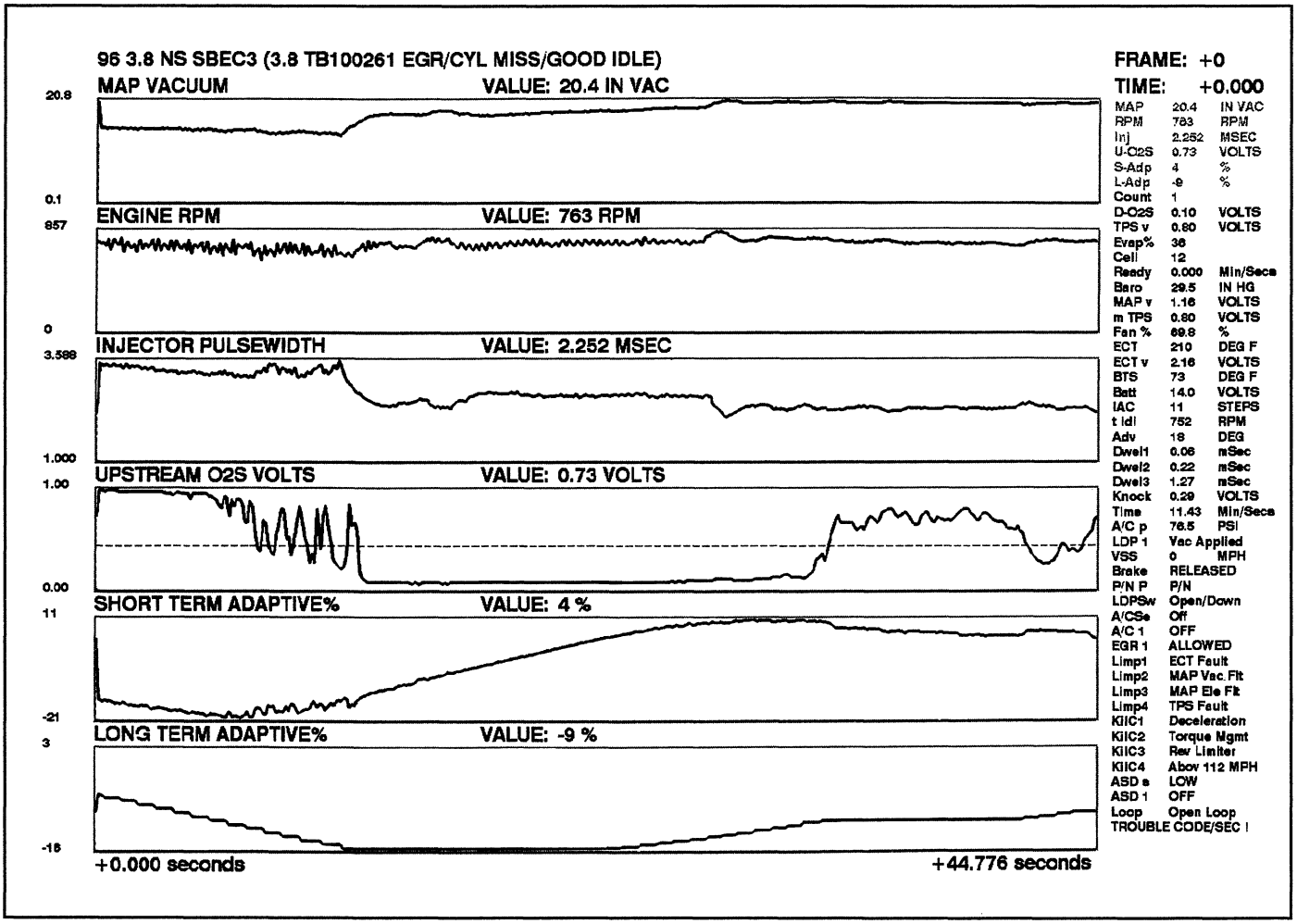


Fig. 3

- Grounded circuit (Fig. 4) - wiring worn through or cut (shorted to ground)
- TPS volts are out of range but it is a possible malfunction
- Some vehicles may allow us to display calculated TPS
    - Use calculated volts to verify condition
    - If the PCM does not see a failure, then calculated and actual TPS will match
- The second way this can be verified is by looking at injector pulse
- If the engine RPM sags after injector pulse then the throttle was probably not open
    - Pulse width increase without an actual need (no real throttle opening) engine stumbles due to rich mixture
- Notice PCM substitution of Minimum TPS and how it ramped the value back down after the problem went away
- Notice secondary indicator and actual code

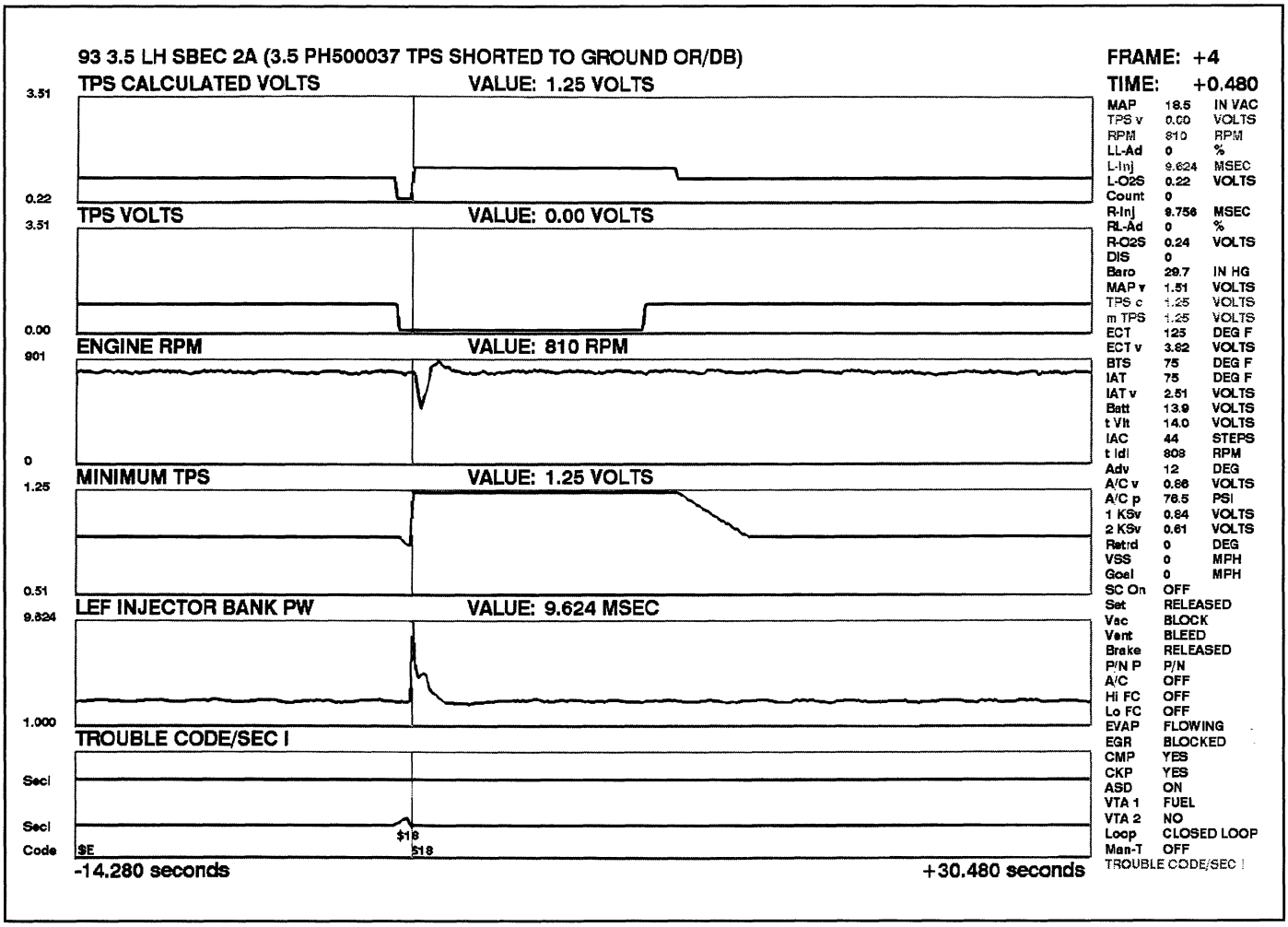


Fig. 4

- Calibration or poor circuit connections - (Fig. 5)
  - Coolant sensor out of calibration
    - Unnatural changes or impossible changes in sensor values
      - Not possible to cool down 100°F in about 5 seconds
    - Prior to OBD II this type of condition did not set fault codes
      - Open and shorts set codes
      - OBD II rationality checks should set a code for this
    - May cause other fault codes to set
      - May cause a fuel at rich limit

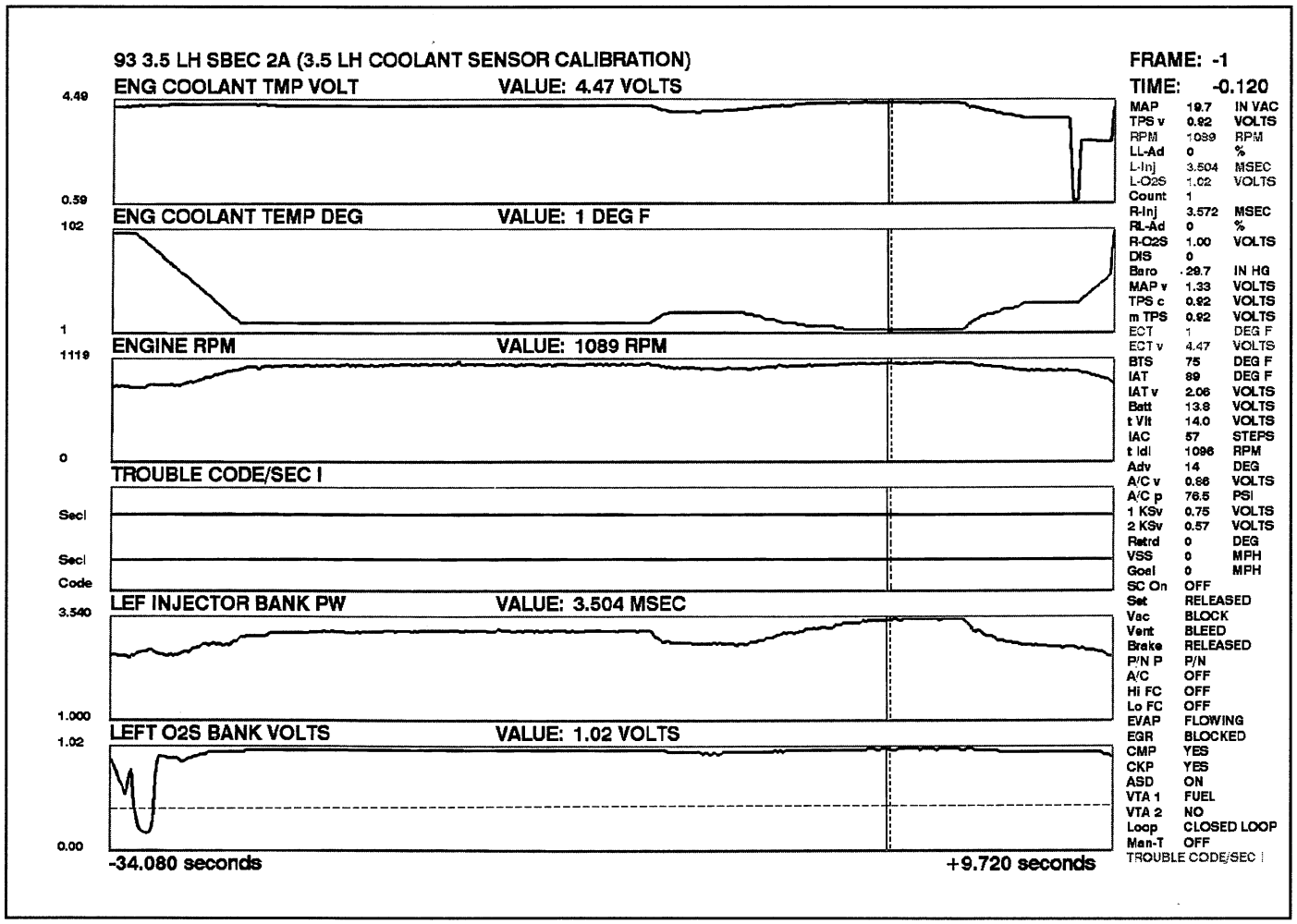


Fig. 5

Fuel Injection Data Recording

- Engine Mechanical - Dead cylinder
  - Internal Cylinder Problems
    - Intake/Exhaust valve leaks or floats (Figures 6 & 7)
    - The variations in the pattern of the RPM line are more radical
      - Use display tools (F7) to provide a more pronounced picture
    - Because the volume in the intake is being increased due to the leak, manifold vacuum is decreasing/pressure increasing
    - Because vacuum is decreasing the PCM will add fuel
    - RPM increases because of the extra fuel so the IAC starts to close

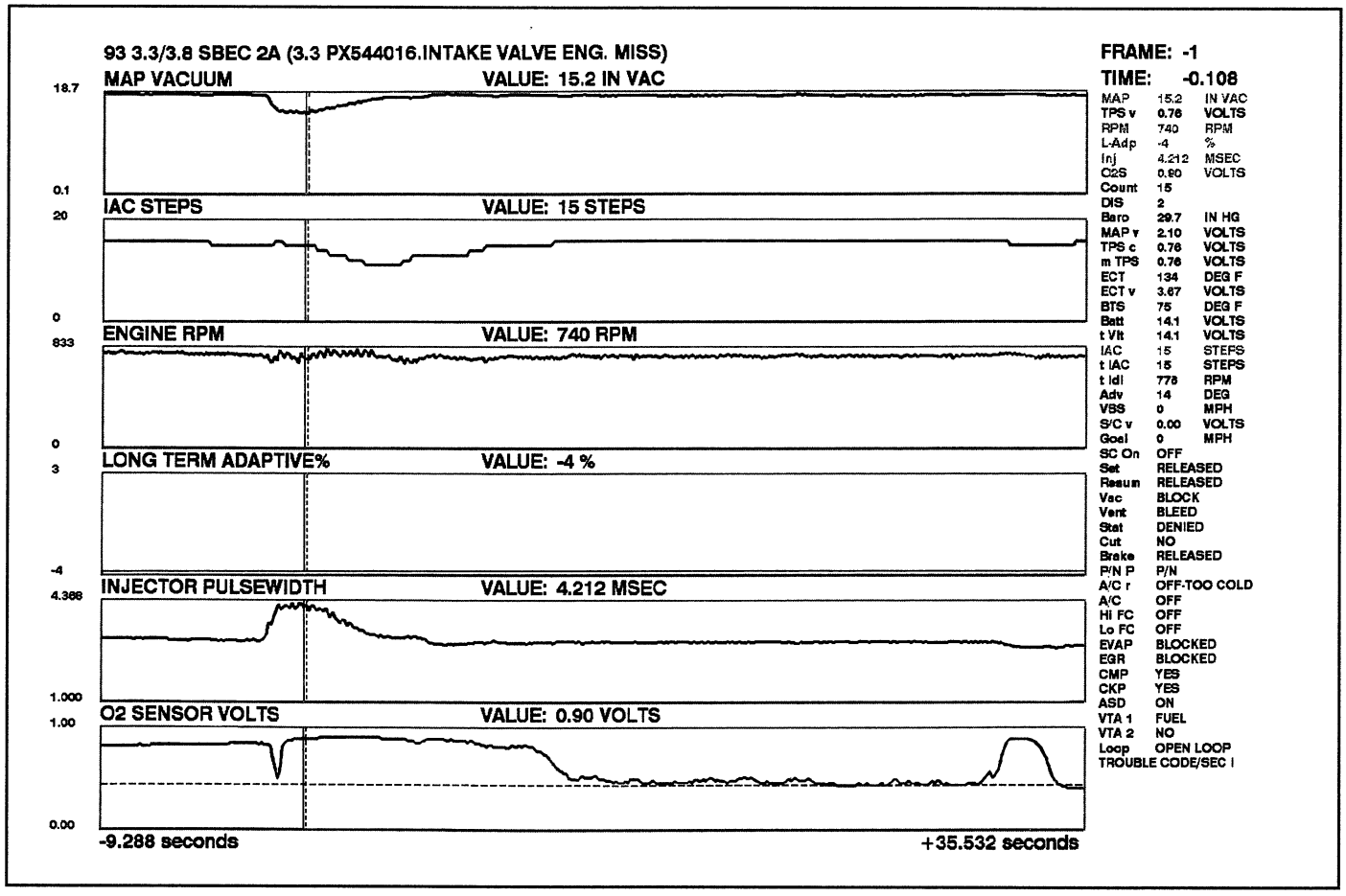


Fig. 6

Fuel Injection Data Recording

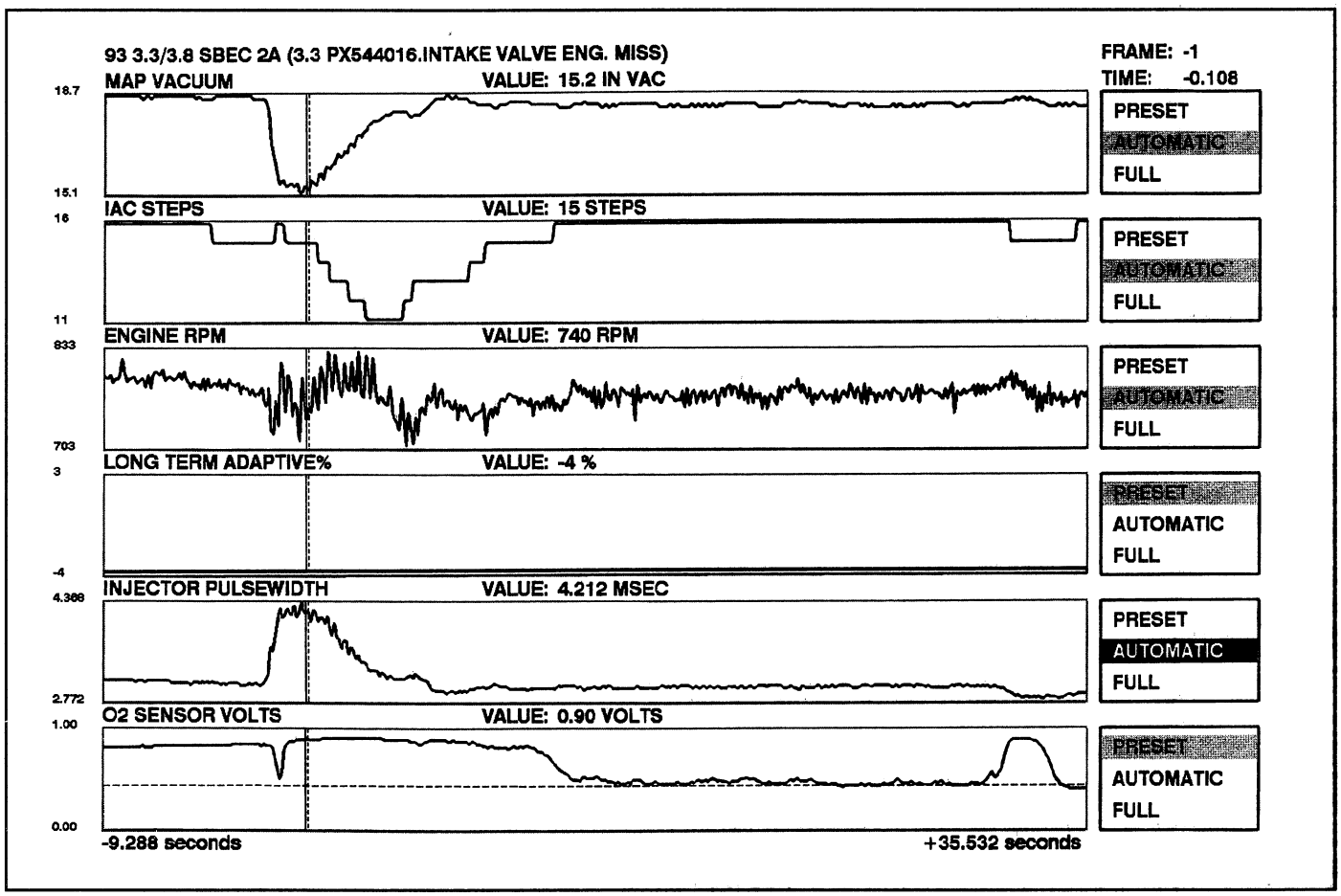


Fig. 7

- Figures 8 & 9 show a more severe example
  - MAP vacuum can be used as a vacuum gauge

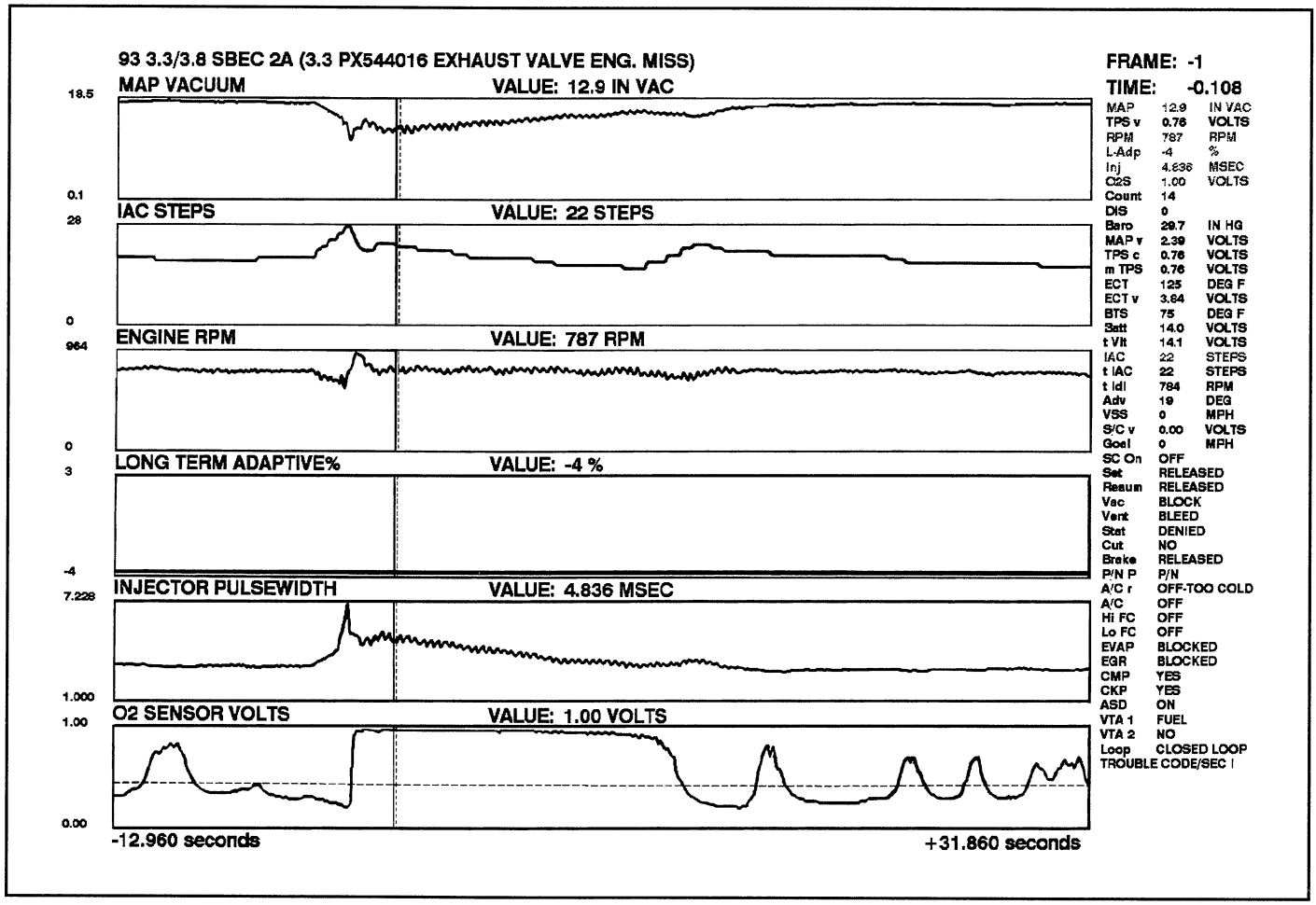


Fig. 8

Fuel Injection Data Recording

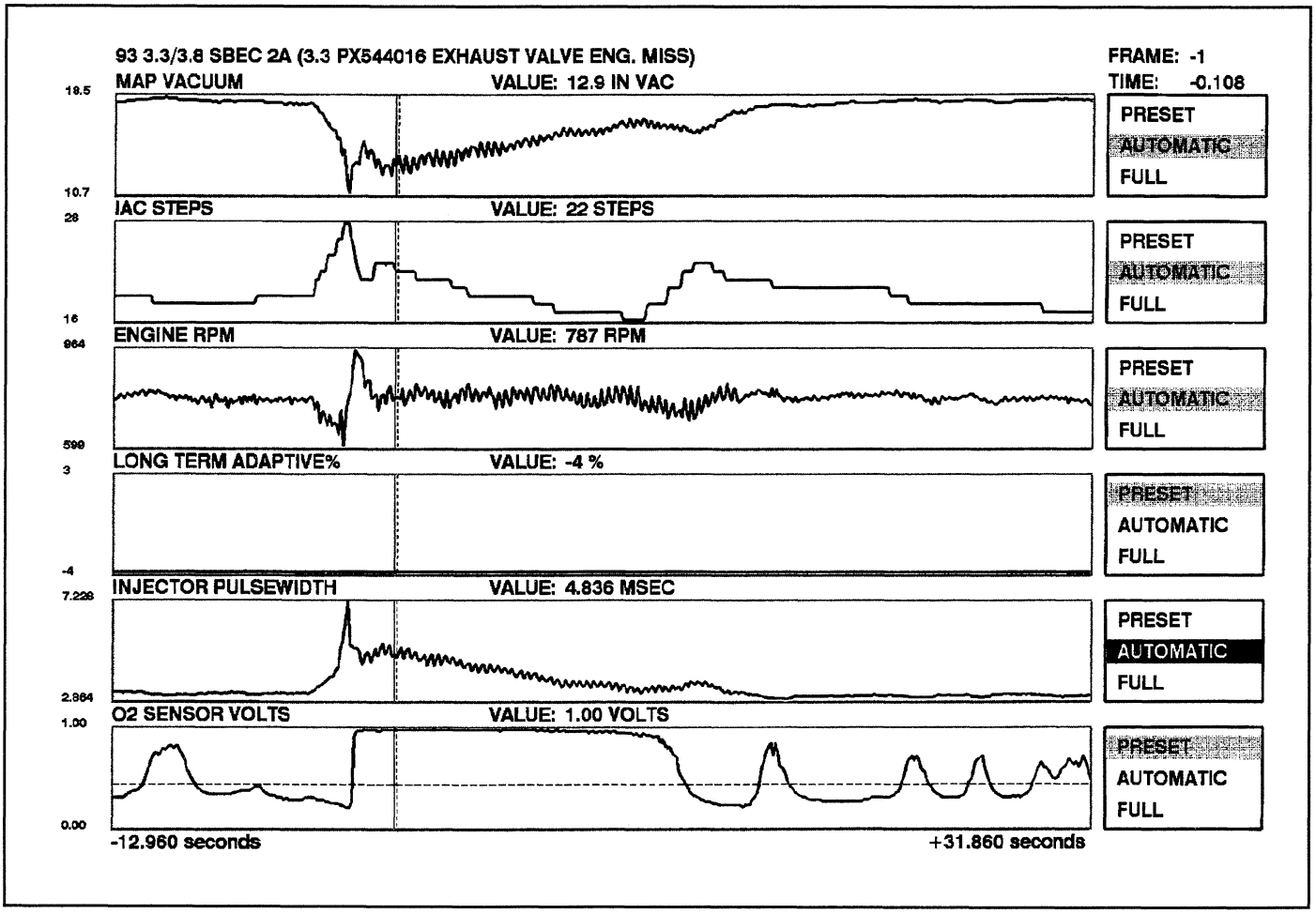


Fig. 9

- Secondary ignition or injector failure (Figures 10 & 11)
  - MAP lines are not saw toothed in comparison to graphs of internal engine problems
  - The RPM line is not as radical as the internal problem
  - The O2 sensor in this case reports a high oxygen content since the cylinder is a good air pump and we are minus either the fuel or spark we need for combustion
- Compare internal and external cylinder problems
  - Internal added fuel due to drop in MAP and mixture went rich because the cylinder didn't pump correctly (exhaust gas entered the intake manifold)
  - External also added fuel, although the drop in MAP wasn't as great, but didn't go rich because the oxygen was pumped correctly and didn't burn

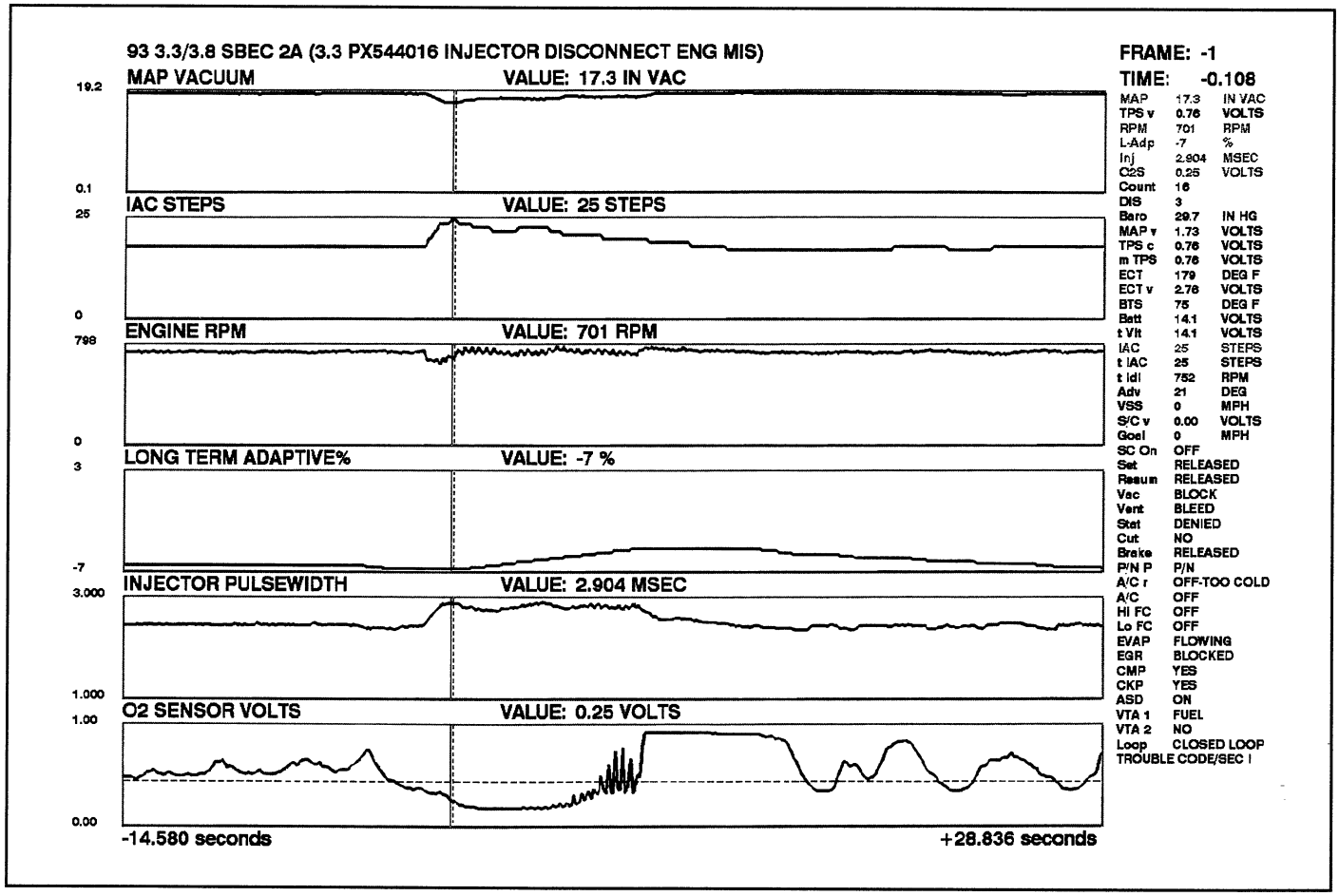


Fig. 10

Fuel Injection Data Recording

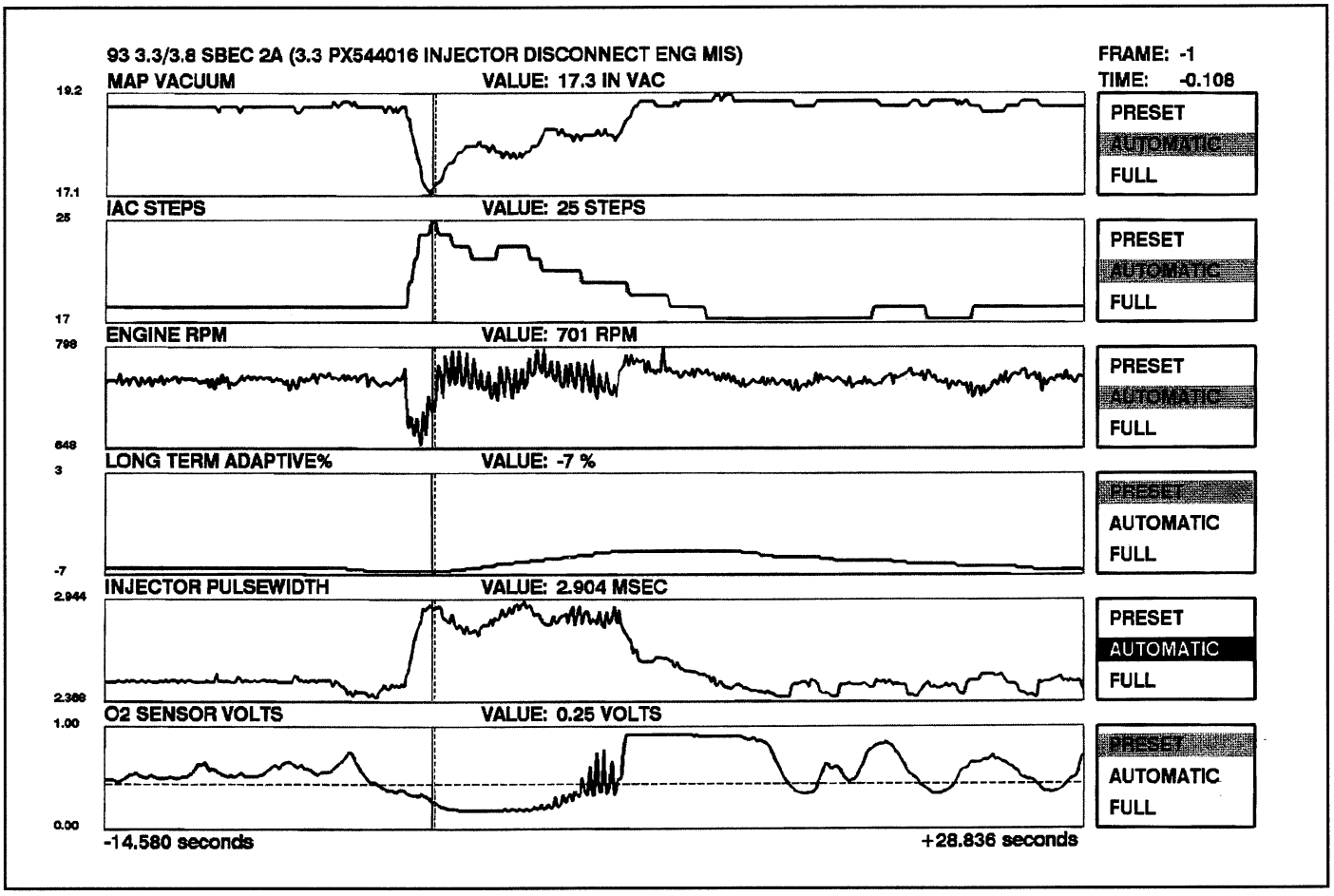


Fig. 11

Fuel Injection Data Recording

- Engine Support Systems
  - Fuel System (Fig. 12)
    - The O2 sensor indicates a lean condition before the MAP and RPM lines start to drop off and stay lean in spite of the large pulse width increase from the PCM trying to keep the engine running.
    - While this could be a coil problem it could not be pickup related because the RPM line drops off gradually.

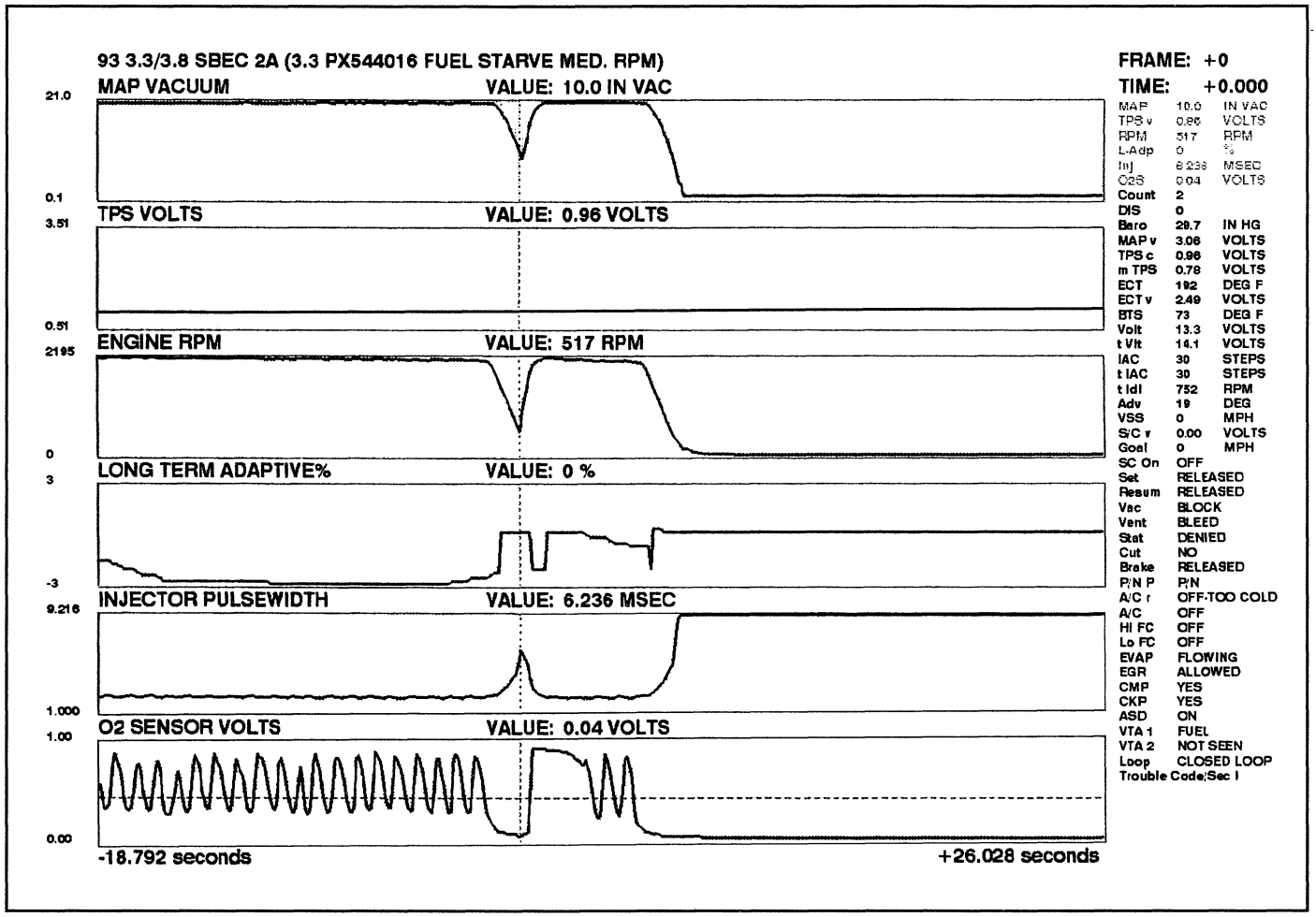


Fig. 12

- EGR System Figures 13 & 14
  - Even though it is inert, exhaust gas from the EGR valve does have volume therefore it affects the MAP input. Since the oxygen content of exhaust is considerably less than atmosphere the oxygen content will be lower than it should be for a given map input.
  - The exception is the opposite condition- the EGR valve remains closed when it should be open. In this condition we must remember that when the fuel calibrations where written, EGR was taken into account SO oxygen content is now higher than it should be for a given map input.
  - In both cases map vacuum will be lower than normal and (no sharp points) (amplitude gradually changing) (inside angle N/A) providing it isn't reacting to another change ie TPS , hills, and or A/C.
  - Engine RPM will be (sharp point) (varying amplitude)
  - Engine RPM dropped yet so did MAP and TPS didn't change
    - Look at IAC steps, they should have increased
    - Not enough power need more air if throttle is idle position.
  - Injector pulse width increased more than necessary for the current oxygen content
    - Pressure increase within the intake manifold
    - Loss of oxygen due to EGR (inert gas)
  - Then RPM fluctuated and rose as well as MAP when EGR was released
  - Yet pulse width decreased as oxygen content rose. At this time review the difference between a cylinder miss versus EGR. Use the difference of how they effect the RPM line.

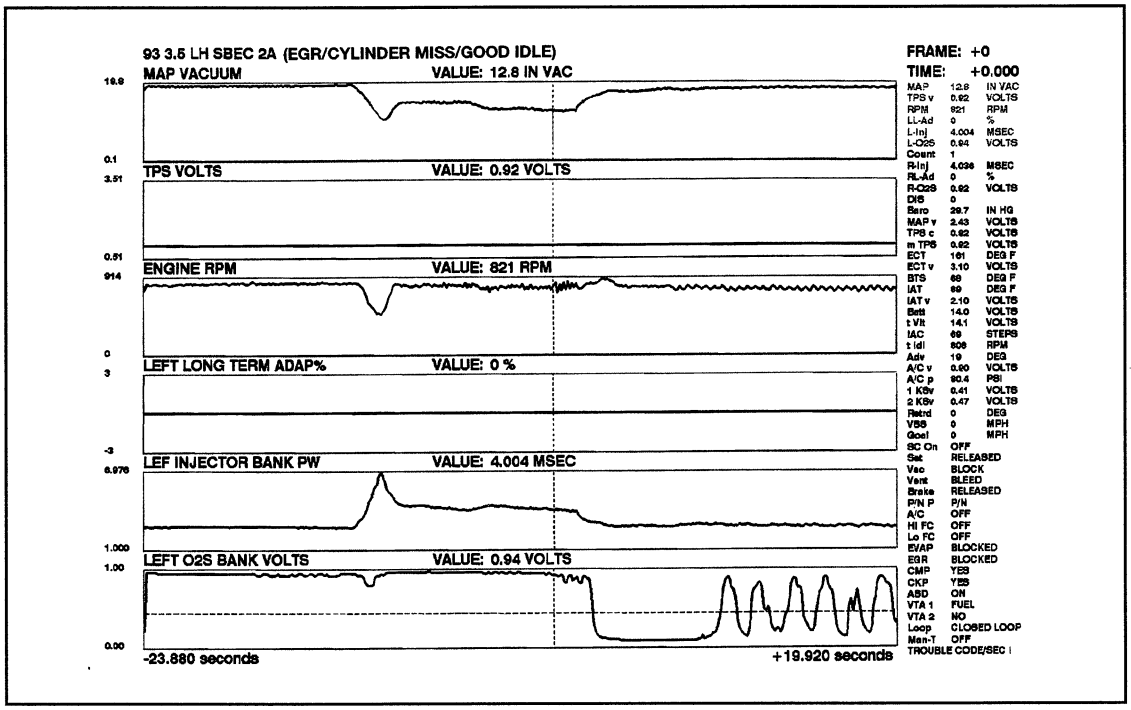


Fig. 13

Fuel Injection Data Recording

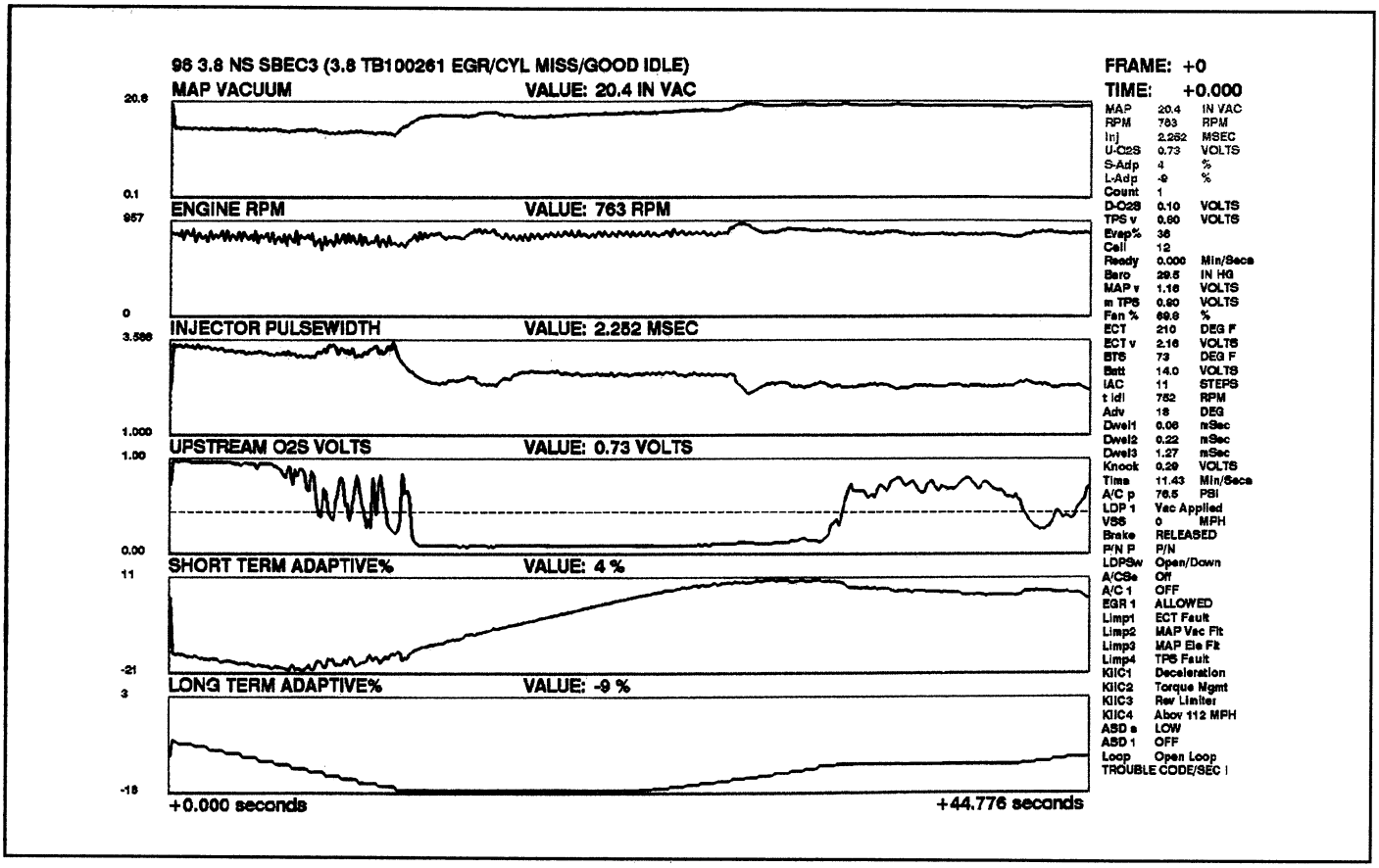


Fig. 14

- Vacuum leaks (Figures 15 & 16)
  - Mention that the square wave pattern seen for IAC is caused by the PCM trying to close IAC further after it has hit zero or has failed electrically
  - Actual RPM is staying above target idle.
  - To determine the difference between a faulty IAC circuit motor or an air leak make a recording of the start up idle flare or use DRB in stand alone mode and select RPM set feature (actuator)

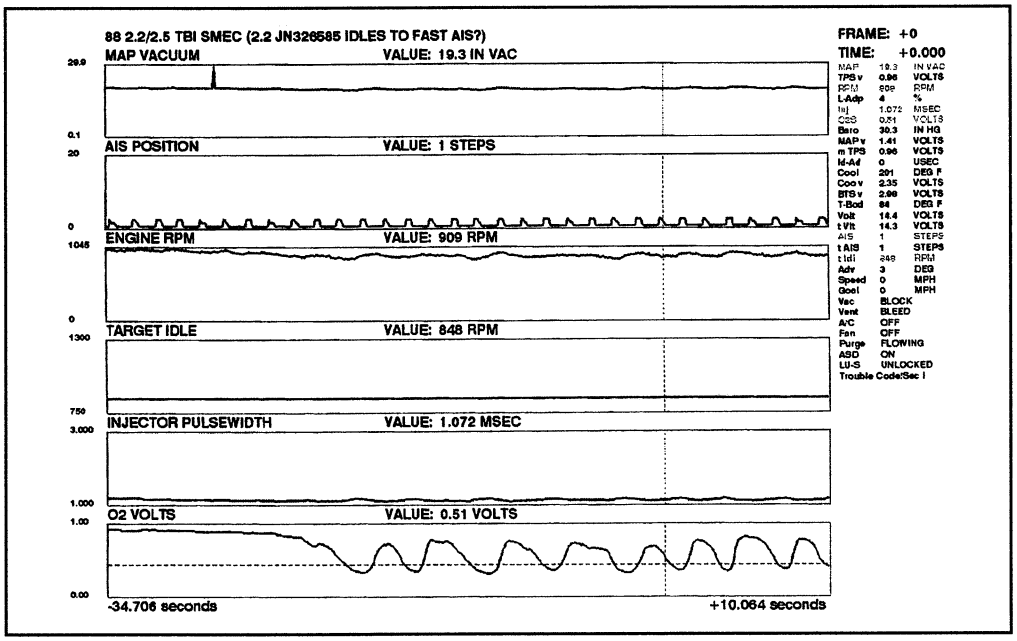


Fig. 15

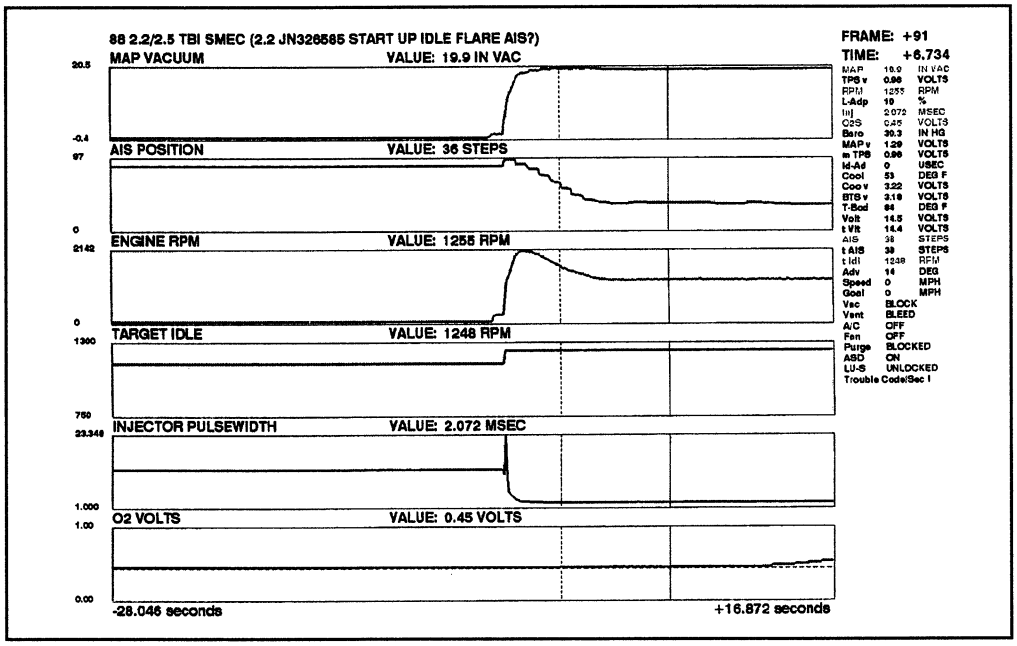


Fig. 16

Fuel Injection Data Recording

- PCM Data - Adaptive Memories (Figures 17 & 18)
  - Mention that cruise control & charging systems won't be discussed in this course other than to answer questions.
- There are different memory cells
  - The cell we use is determined by many factors. Some are RPM, MAP, TPS on some cars.

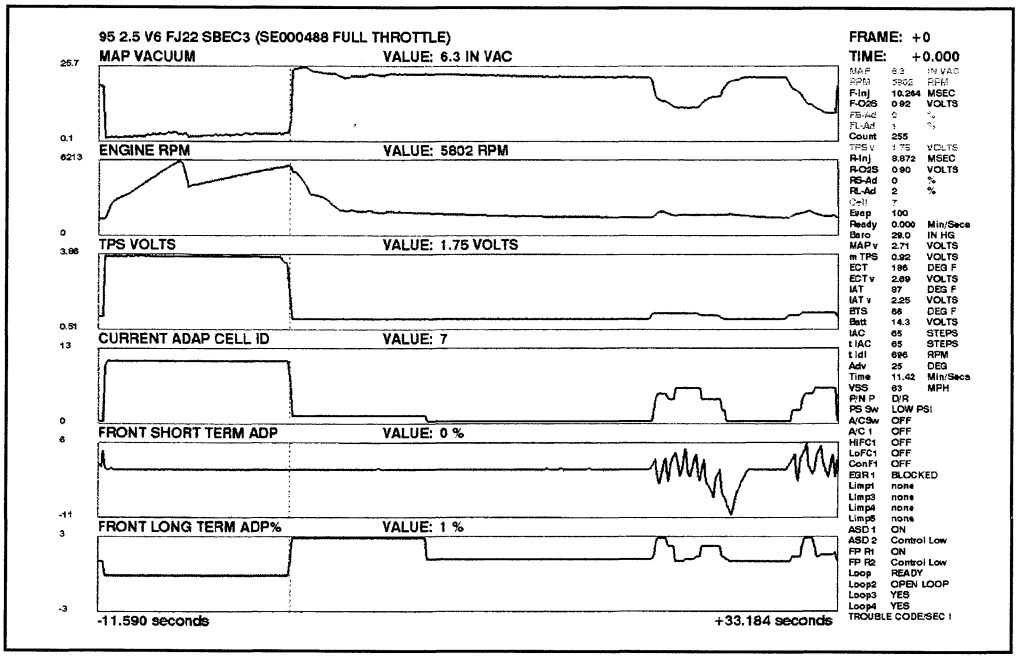


Fig. 17

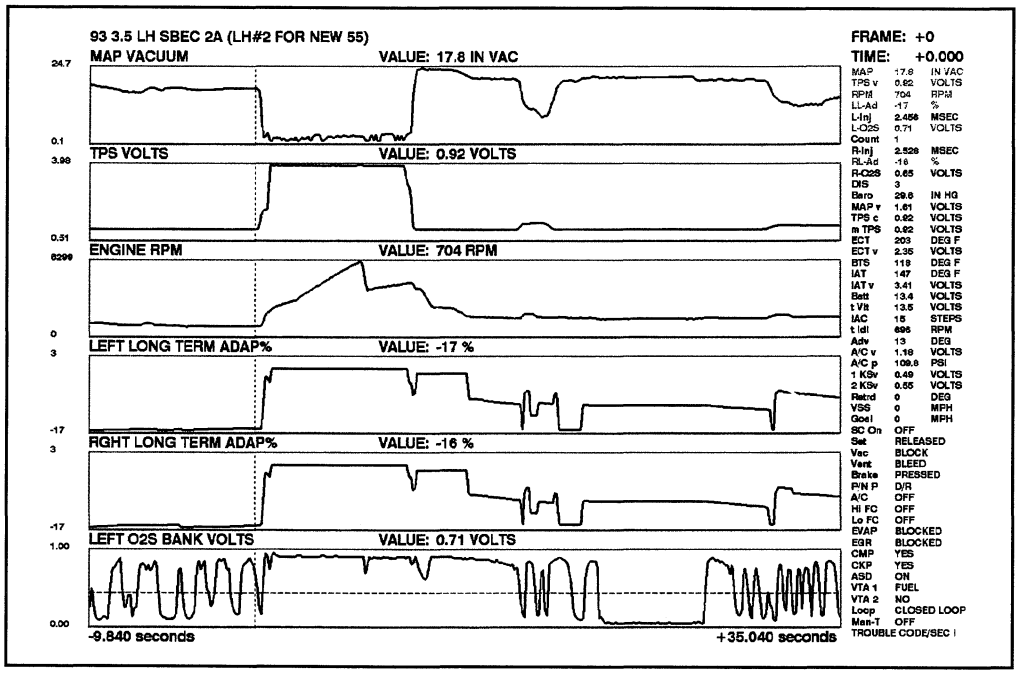


Fig. 18

Fuel Injection Data Recording

- Trouble Codes & Secondary Indicators (Fig. 19)
  - This is a quick way of telling if the PCM saw anything wrong at the time our problem occurred.
  - Explain the difference between secondary indicators & fault codes.

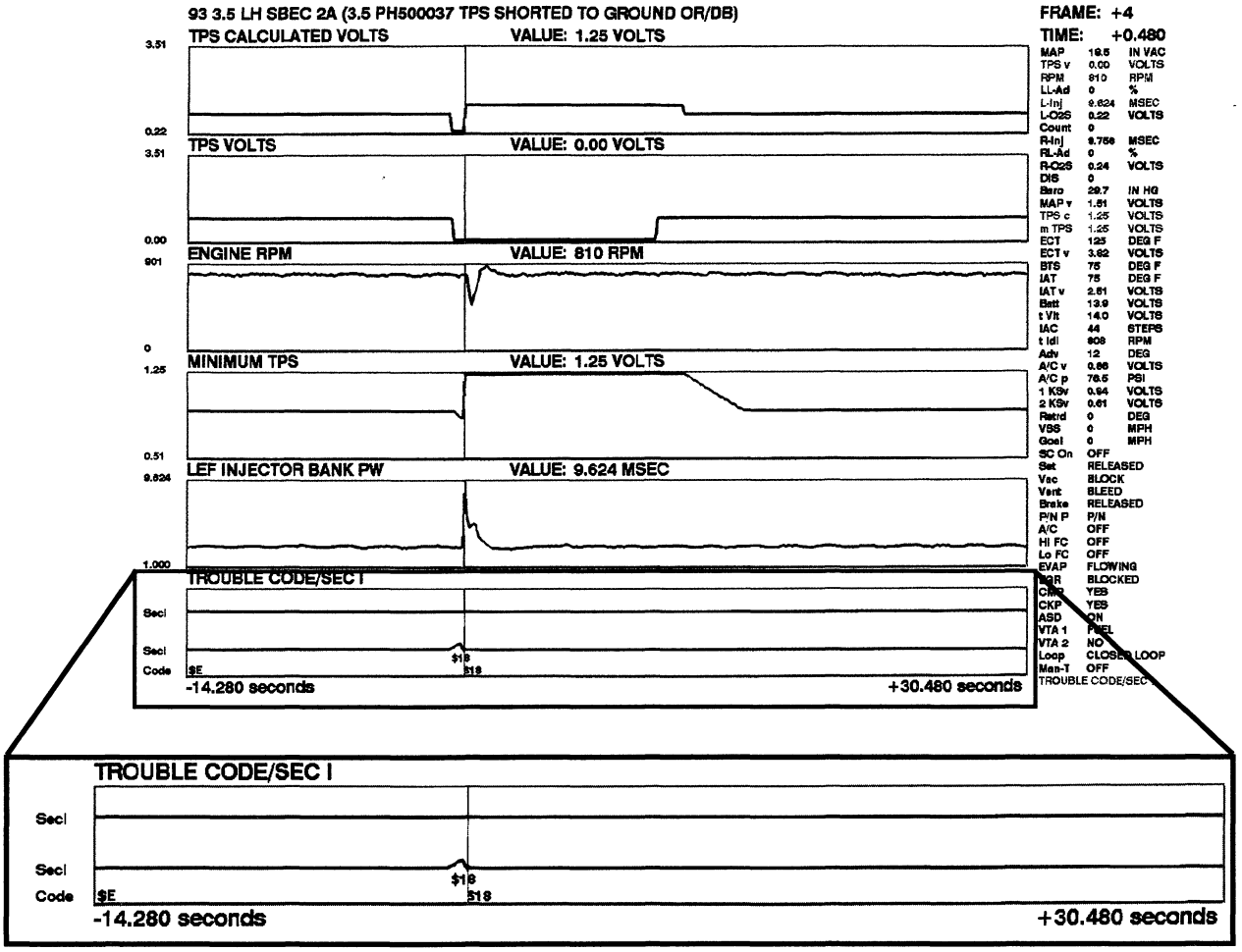


Fig. 19

Fuel Injection Data Recording

Method of approach to interpreting data recordings

- Can the condition shown really exist?
  - Can the coolant temperature drop 100°F and climb back up in 5 seconds?
  - Can vertical changes in MAP vacuum actually happen?
    - Pull up voltage
    - Pull up trouble codes
  - Can engine change 2000 RPM in one frame of recording?
- If it can exist, prove it by finding two other indicators that will support the reading
  - For example: TPS is at 3.97 volts
    - This indicates WOT
    - MAP should show a drop
    - Engine RPM should be increasing
- Look at the texture of the line under investigation
  - Do the textures of the supporting graphs match
    - If TPS is real erratic MAP should be also
    - If TPS is real erratic there should be abnormal spikes in the injector graph
  - Is the condition normal, what are the operating conditions?
    - When the transmission shifts during a steady throttle increase
      - Engine RPM ratio to vehicle speed changes
      - MAP should change while TPS remains steady
    - At WOT
      - O2 sensor volts change from switching to steady high
      - MAP drops suddenly low
      - Engine RPM should ramp up until shifts occur or throttle is released

Line characteristics - things to note

- Since a graph line is a time line, vertical changes indicate changes that may be to fast to be physically possible.
- When a line changes direction pay attention to the way it makes the turn.
  - Is the point sharp or rounded ?
  - Does the inside angle vary or remain constant ?
- Does the amplitude of the line pattern remain the same, change randomly or repeat ?

Fuel Injection Data Recording

Reference Fig. 20 for the following examples.

- Example: A cylinder miss will cause the rpm line pattern to have sharp points, relatively constant inside angle, and maintain the same amplitude.

- Example: An EGR valve that is open when it should not be will exhibit the following
characteristics:
    1. The amplitude of the rpm line increases or decreases (varies) from one peak to the next.
    2. The inside angle is also variable.
    3. The points are sharp.

This process of analyzing the line should be applied to all sensor graphs. Although the process is the same for all sensors, each sensor is different; so —- it should be remembered that the line tells us about that sensor and the physical condition it is converting to an electrical signature.

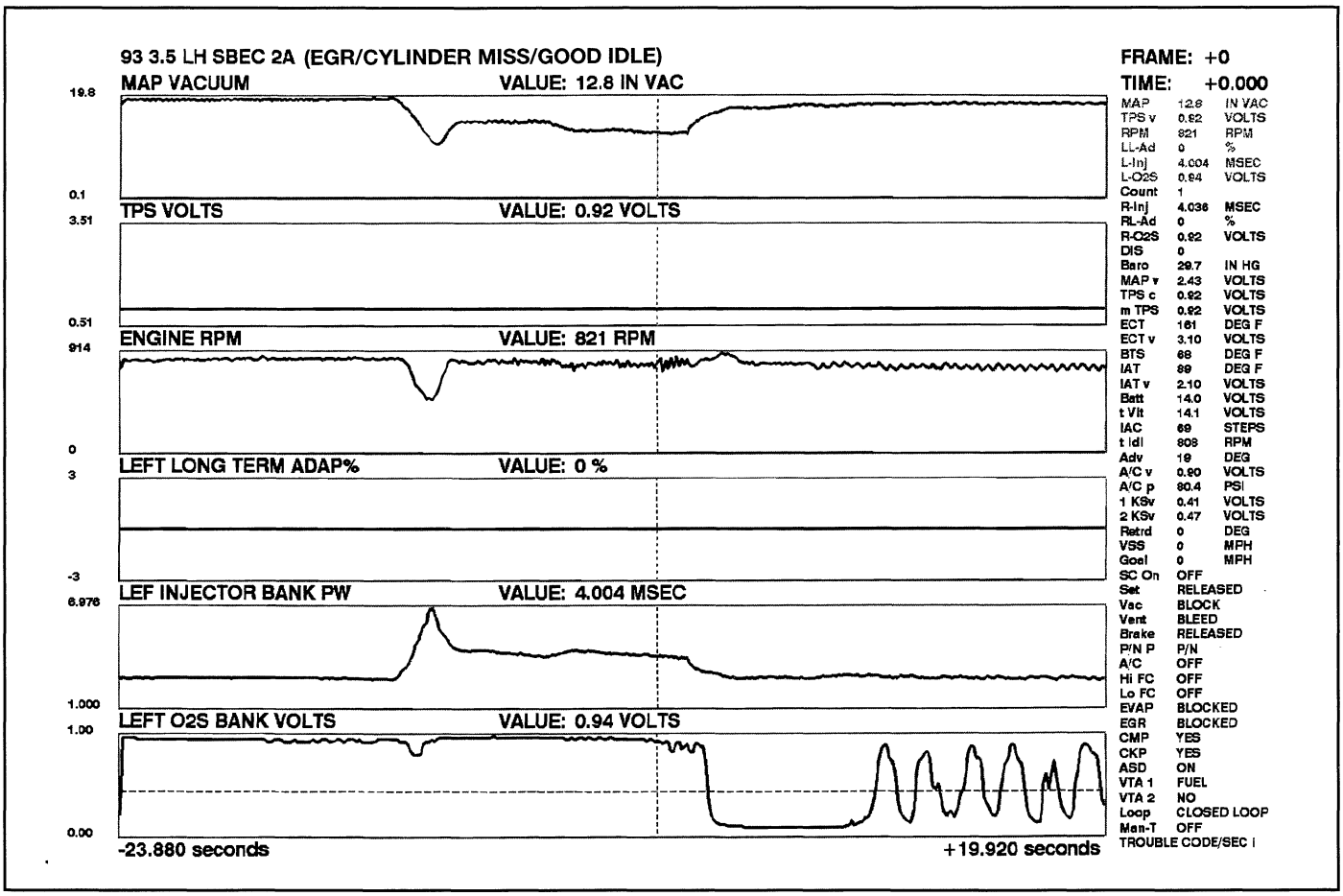


Fig. 20

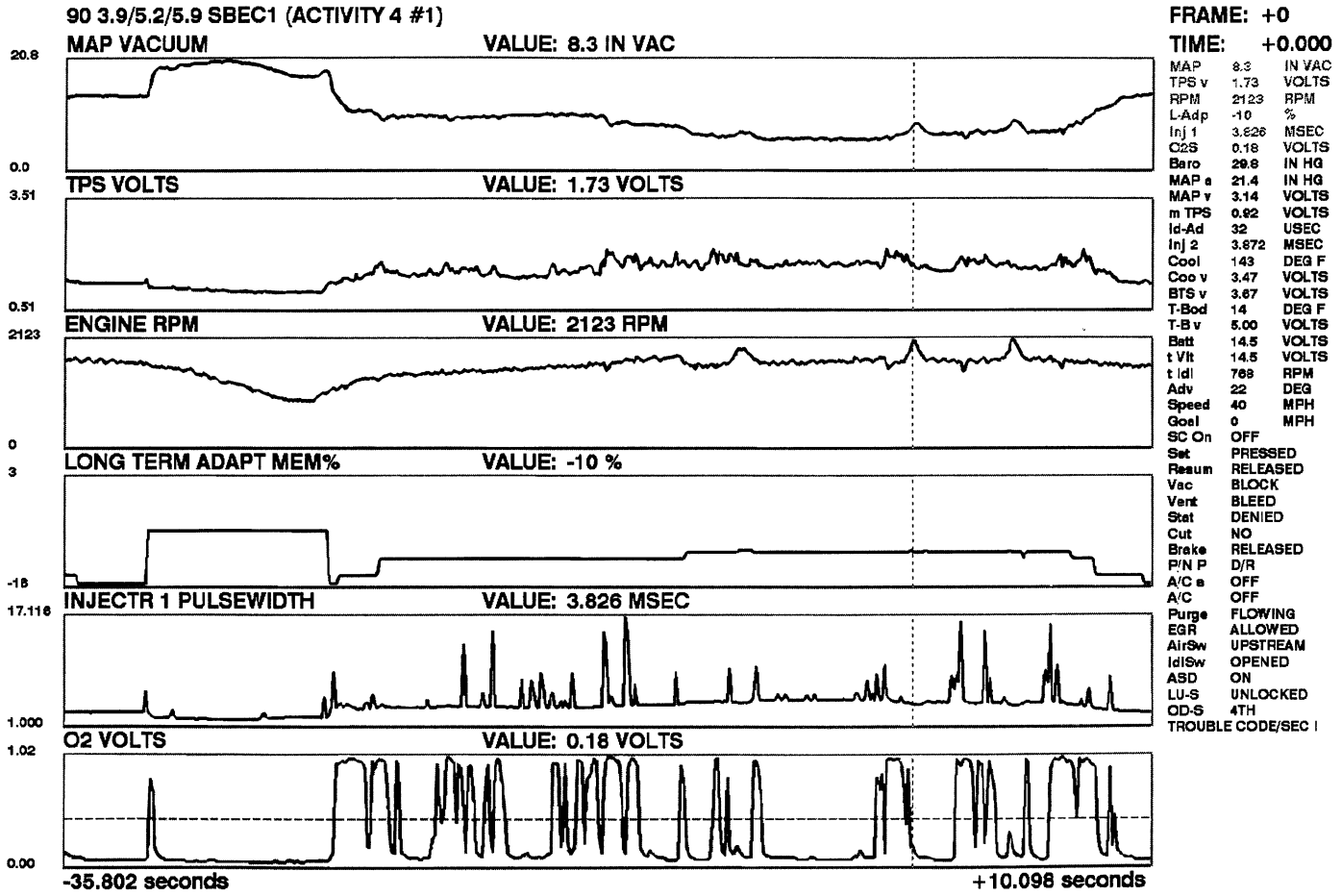
Activity 4

Reading Data Recordings

Fill in the blanks by looking at the Data Recording for that number. For example, the Data Recording named Activity 4 #1 should be used to answer question #1.

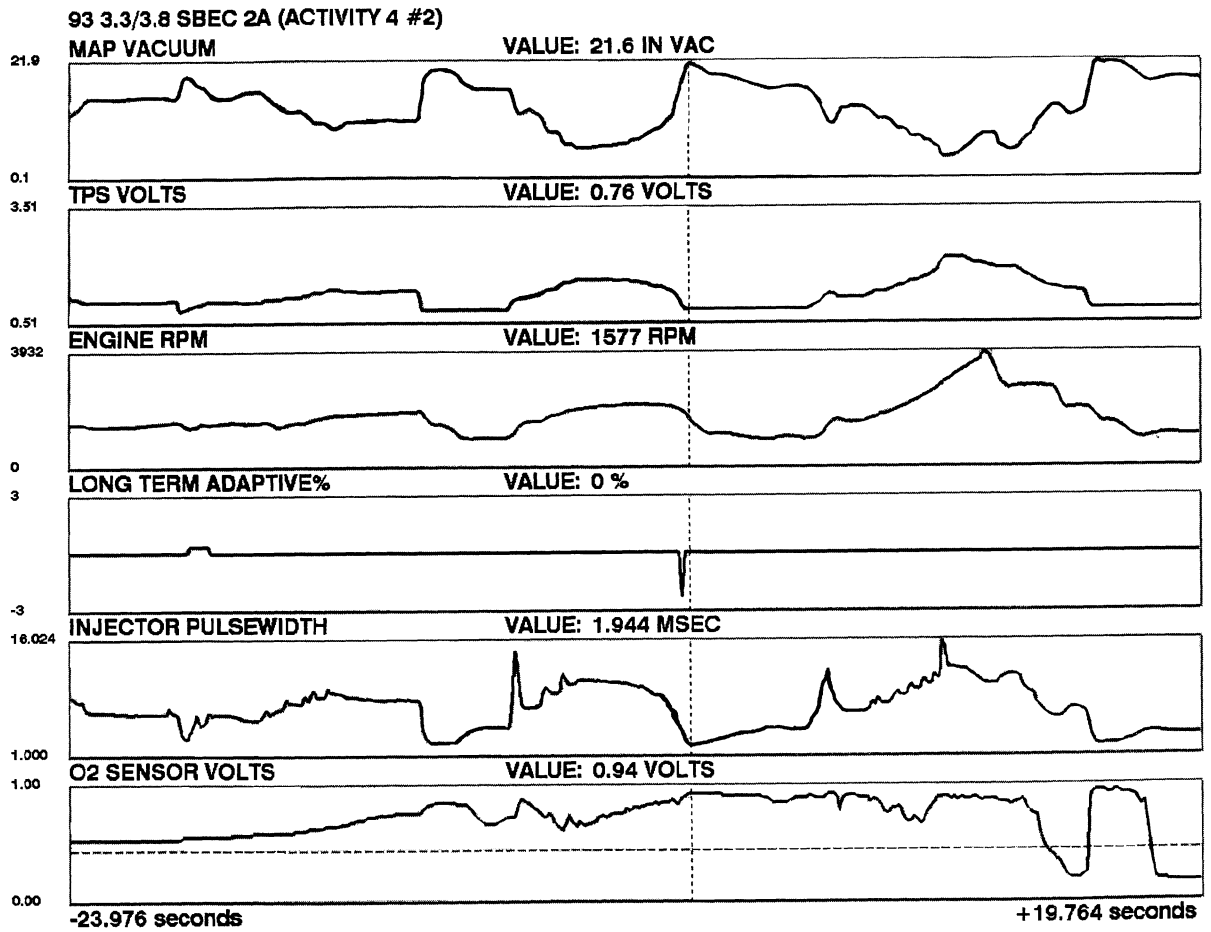
1. Does this recording appear to be normal Yes ____ No____
   If it does not appear to be normal can you identify the:
   Condition _____
   Problem _____
2. Does this recording appear to be normal Yes___ No ____
   If it does not appear to be normal can you identify the:
   Condition _____
   Problem _____
3. Does this recording appear to be normal Yes___ No ____
   If it does not appear to be normal can you identify the:
   Condition _____
   Problem _____
4. Does this recording appear to be normal Yes ____ No____
   If it does not appear to be normal can you identify the:
   Condition _____
   Problem _____
5. Does this recording appear to be normal Yes ____ No____
   If it does not appear to be normal can you identify the:
   Condition _____
   Problem _____
6. Does this recording appear to be normal Yes___ No ____
   If it does not appear to be normal can you identify the:
   Condition _____
   Problem _____
7. Does this recording appear to be normal Yes ____ No____
   If it does not appear to be normal can you identify the:
   Condition _____
   Problem _____
8. Does this recording appear to be normal Yes ____ No____
   If it does not appear to be normal can you identify the:
   Condition _____
   Problem _____
9. Does this recording appear to be normal Yes___ No ____
   If it does not appear to be normal can you identify the:
   Condition _____
   Problem _____
10. Does this recording appear to be normal Yes ____ No____
    If it does not appear to be normal can you identify the:
    Condition _____
    Problem _____

MDS VEHICLE DATA DISPLAY	D3000-03



F3	MODE (MORE)	F1 LEFT	F2 RIGHT			ATM-PREV MENU		

MDS VEHICLE DATA DISPLAY	D3000-03



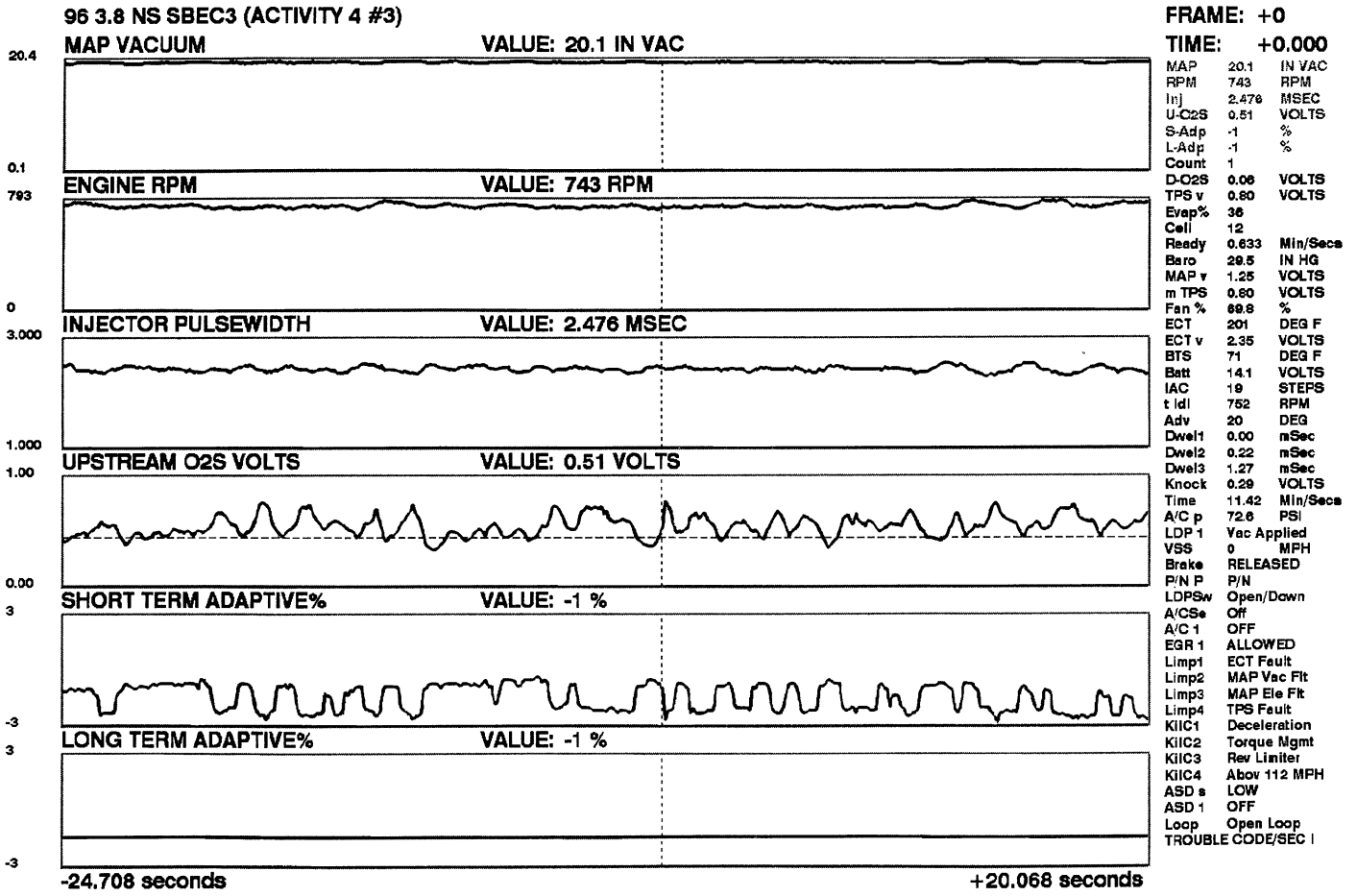
FRAME: +0
TIME: +0.000

MAP	21.6	IN VAC
TPS v	0.76	VOLTS
RPM	1577	RPM
L-Adp	0	%
Inj	1.944	MSEC
O2S	0.94	VOLTS
Count	4	
DIS	0	
Baro	29.6	IN HG
MAP v	0.98	VOLTS
TPS c	0.76	VOLTS
m TPS	0.76	VOLTS
ECT	84	DEG F
ECT v	2.24	VOLTS
BTS	84	DEG F
Batt	14.0	VOLTS
t Vlt	14.1	VOLTS
IAC	45	STEPS
t IAC	45	STEPS
t Idl	728	RPM
Adv	26	DEG
VSS	23	MPH
S/C v	0.00	VOLTS
Goal	0	MPH
SC On	OFF	
Set	RELEASED	
Resum	RELEASED	
Vac	BLOCK	
Vent	BLEED	
Stat	DENIED	
Cut	NO	
Brake	RELEASED	
P/N P	D/R	
A/C r	OFF-TOO COLD	
A/C	OFF	
Hi FC	OFF	
Lo FC	OFF	
EVAP	BLOCKED	
EGR	BLOCKED	
CMP	YES	
CKP	YES	
ASD	ON	
VTA 1	FUEL	
VTA 2	NO	
Loop	OPEN LOOP	

TROUBLE CODE/SEC I

F3	MODE (MORE)	F1 LEFT	F2 RIGHT			ATM-PREV MENU		

MDS VEHICLE DATA DISPLAY	D3000-03



FRAME: +0

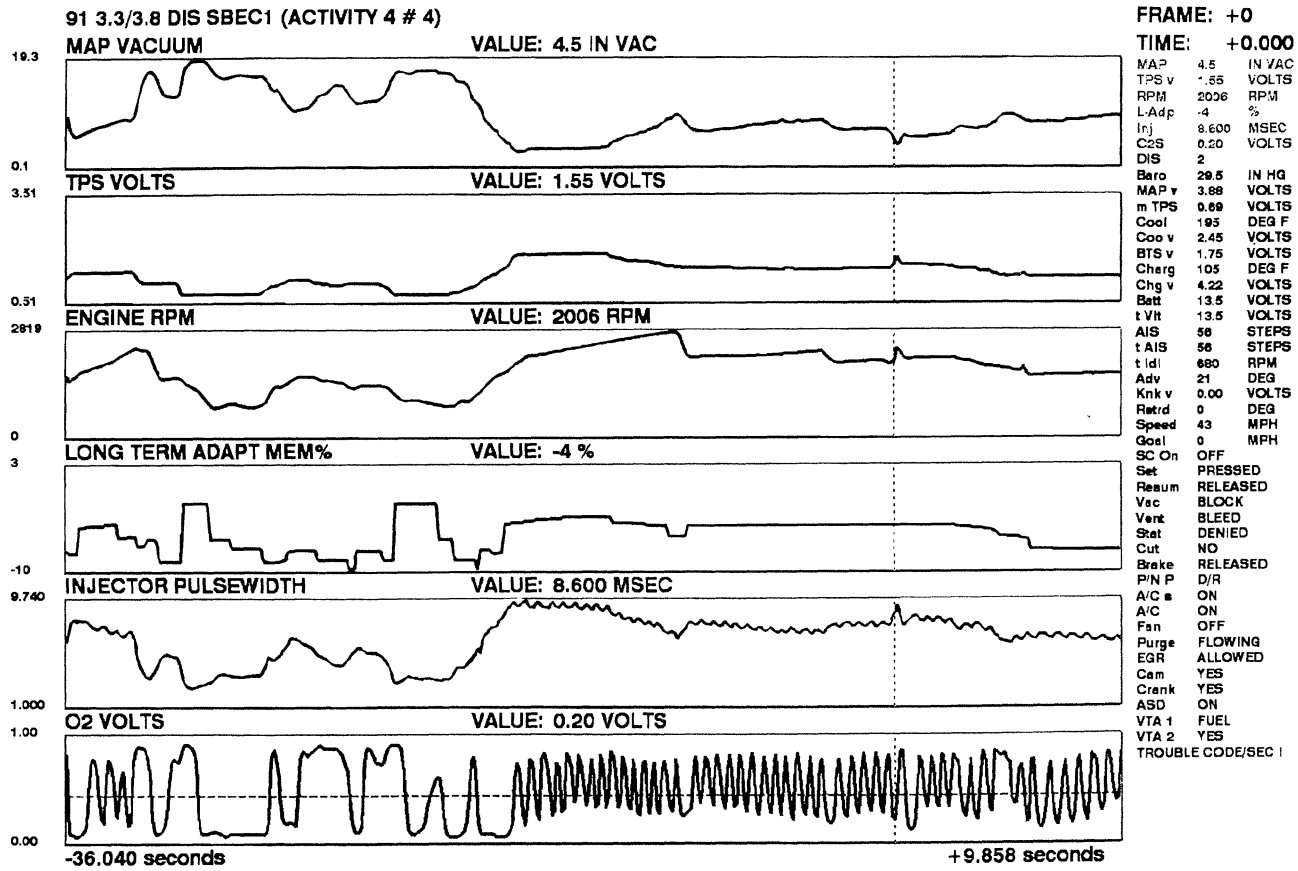
TIME: +0.000

MAP	20.1	IN VAC
RPM	743	RPM
Inj	2.476	MSEC
U-O2S	0.51	VOLTS
S-Adp	-1	%
L-Adp	-1	%
Count	1	
D-O2S	0.06	VOLTS
TPS v	0.60	VOLTS
Evap%	36	
Cell	12	
Ready	0.633	Min/Secs
Baro	29.5	IN HG
MAP v	1.25	VOLTS
m TPS	0.60	VOLTS
Fan %	69.8	%
ECT	201	DEG F
ECT v	2.35	VOLTS
BTS	71	DEG F
Batt	14.1	VOLTS
IAC	19	STEPS
t Idl	752	RPM
Adv	20	DEG
Dwel1	0.00	mSec
Dwel2	0.22	mSec
Dwel3	1.27	mSec
Knock	0.29	VOLTS
Time	11.42	Min/Secs
A/C p	72.6	PSI
LDP 1	Vac Applied	
VSS	0	MPH
Brake	RELEASED	
P/N P	P/N	
LDPSw	Open/Down	
A/CSe	Off	
A/C 1	OFF	
EGR 1	ALLOWED	
Limp1	ECT Fault	
Limp2	MAP Vac Flt	
Limp3	MAP Ele Flt	
Limp4	TPS Fault	
KIIC1	Deceleration	
KIIC2	Torque Mgmt	
KIIC3	Rev Limiter	
KIIC4	Abov 112 MPH	
ASD s	LOW	
ASD 1	OFF	
Loop	Open Loop	

TROUBLE CODE/SEC I

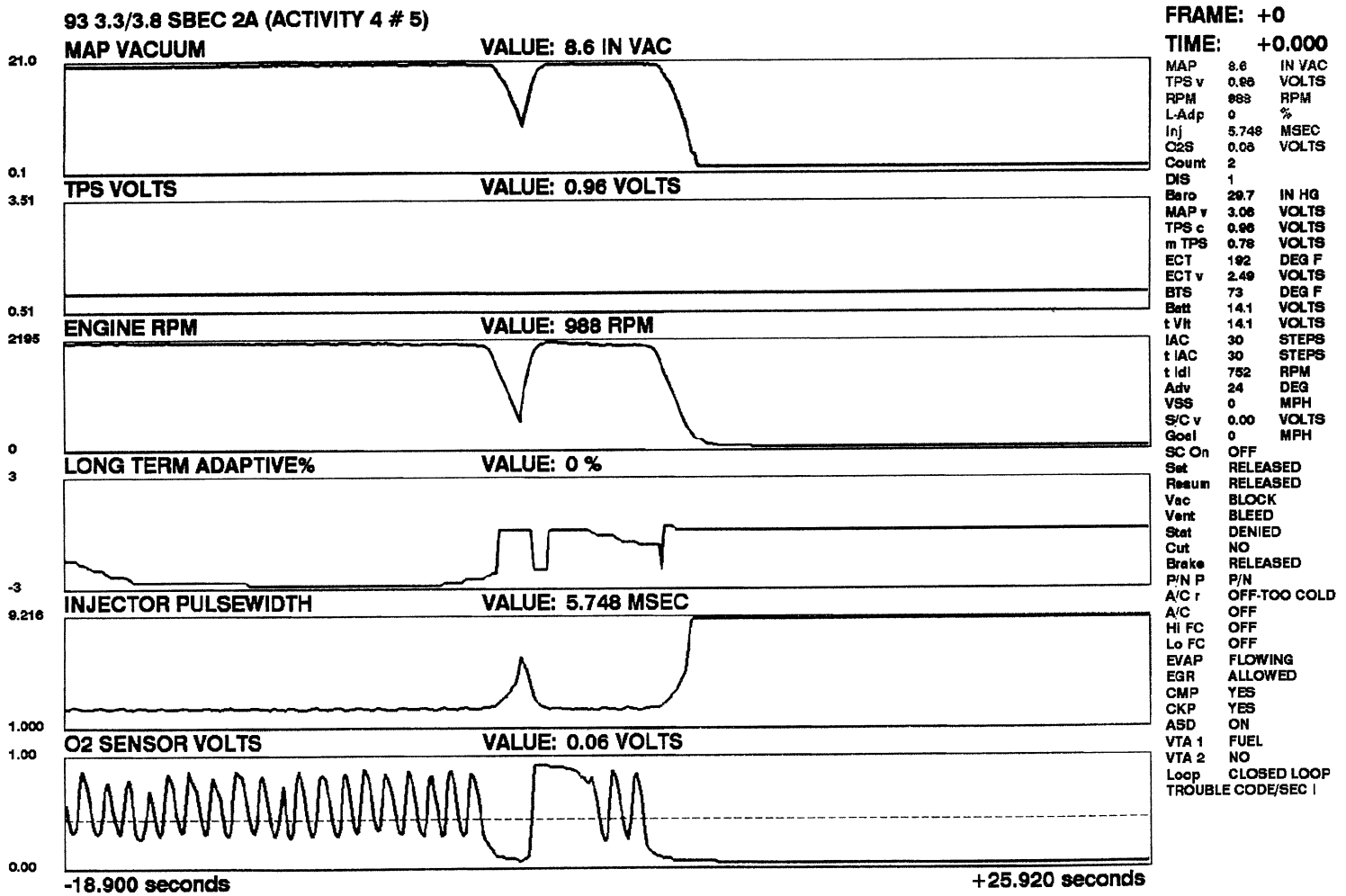
F3	MODE (MORE)	F1 LEFT	F2 RIGHT			ATM-PREV MENU		

MDS VEHICLE DATA DISPLAY	D3000-03



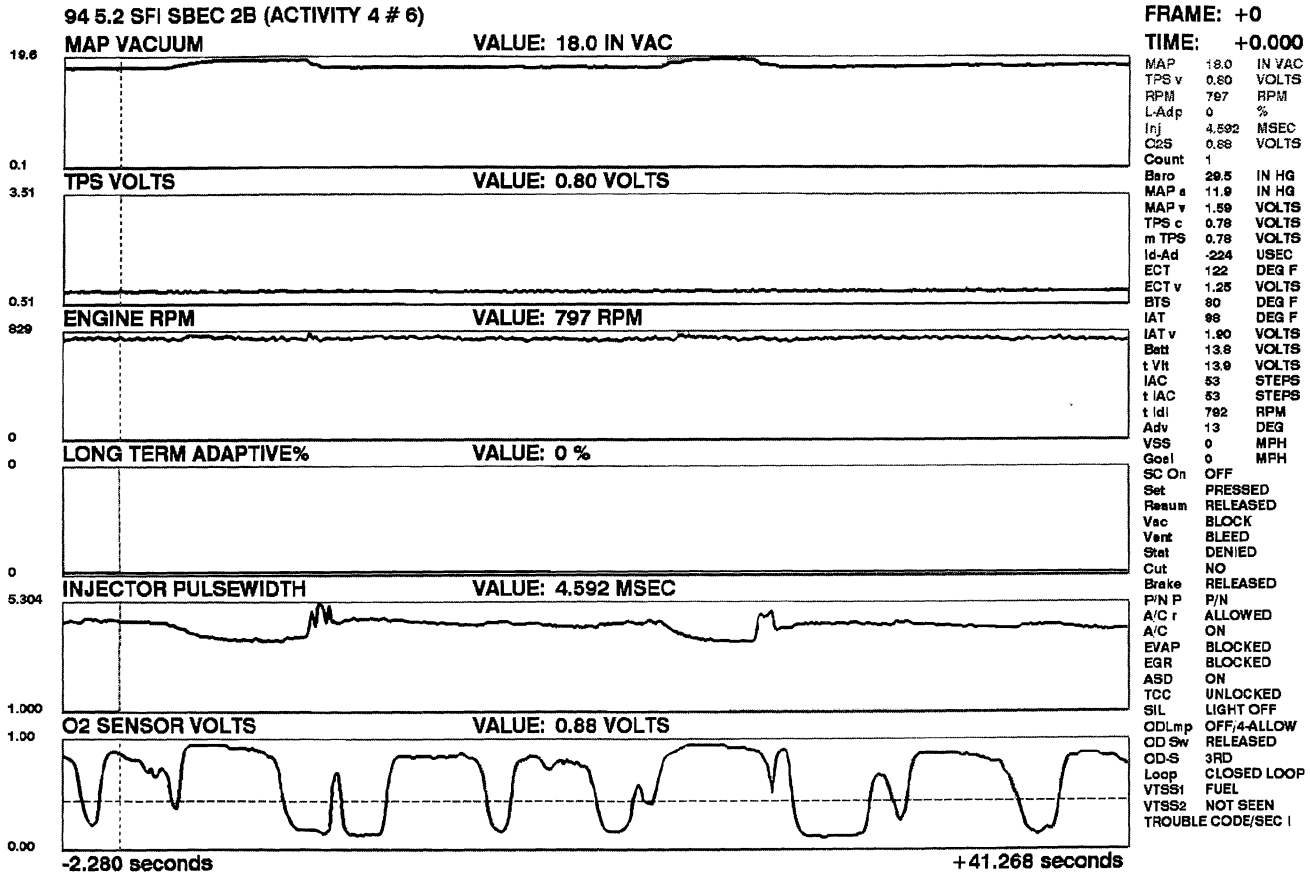
F3	MODE (MORE)	F1 LEFT	F2 RIGHT			ATM-PREV MENU		

MDS VEHICLE DATA DISPLAY	D3000-03



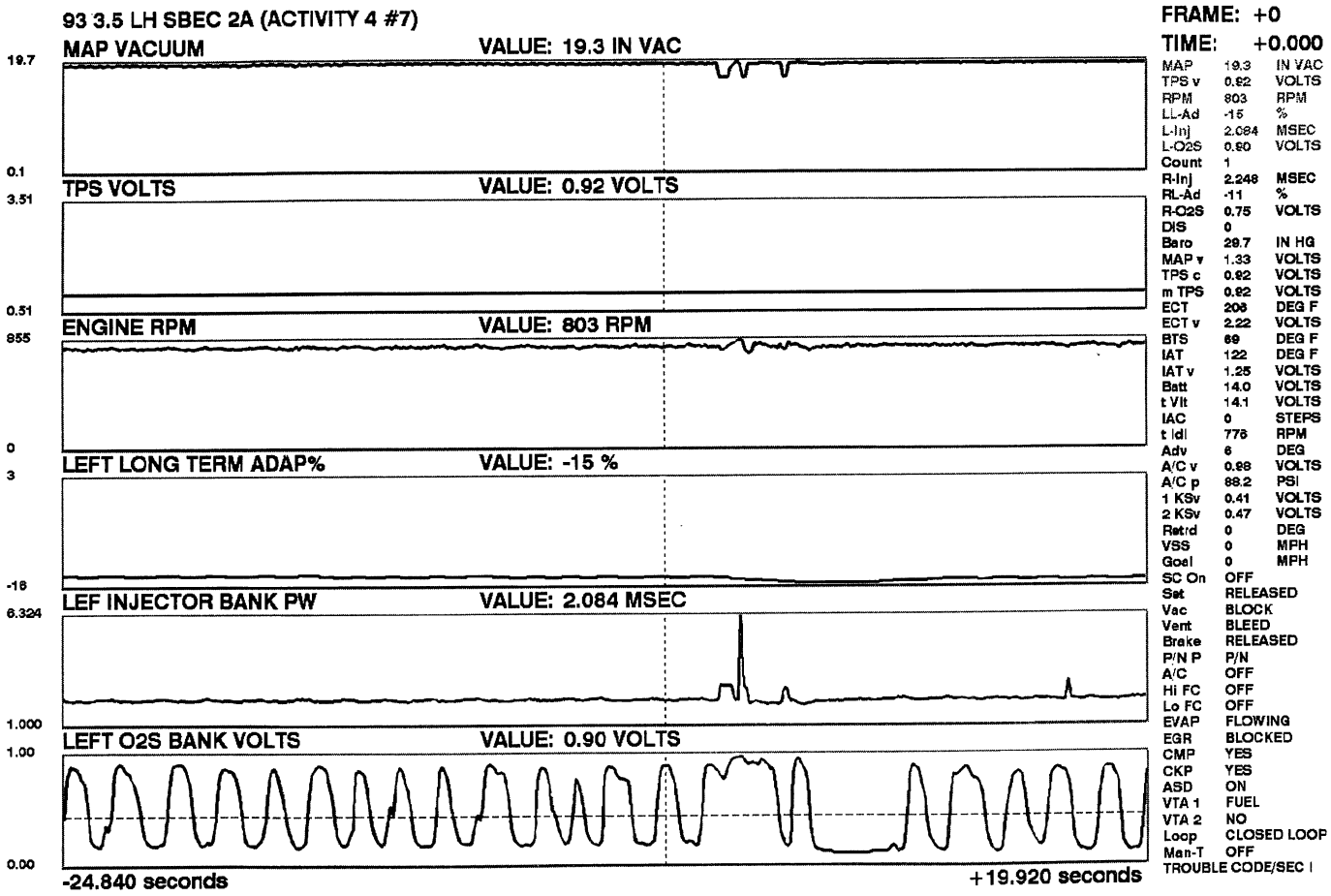
F3	MODE (MORE)	F1 LEFT	F2 RIGHT			ATM-PREV MENU		

MDS VEHICLE DATA DISPLAY	D3000-03



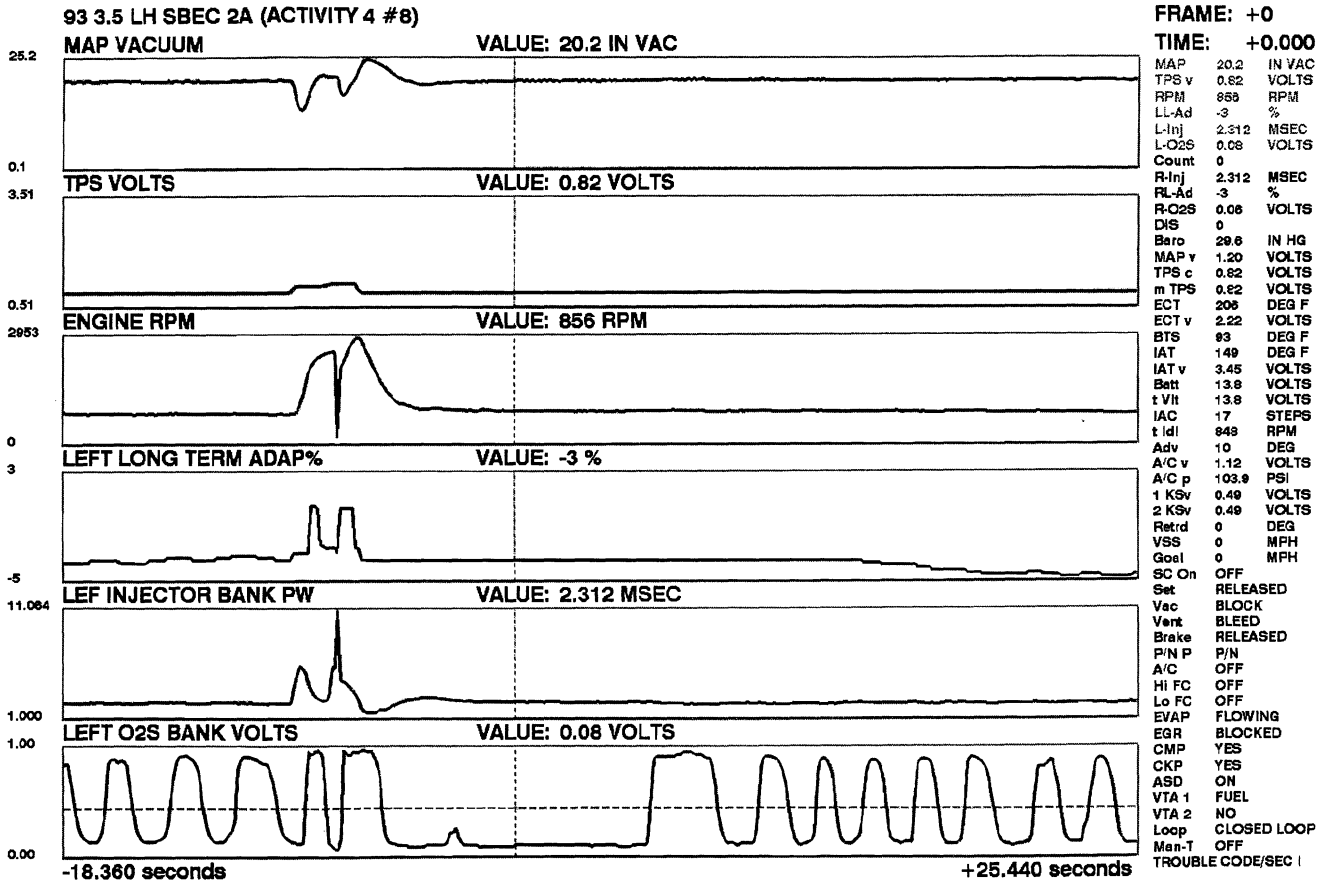
F3	MODE (MORE)	F1 LEFT	F2 RIGHT			ATM-PREV MENU		

MDS VEHICLE DATA DISPLAY	D3000-03



F3	MODE (MORE)	F1 LEFT	F2 RIGHT			ATM-PREV MENU		

MDS VEHICLE DATA DISPLAY	D3000-03



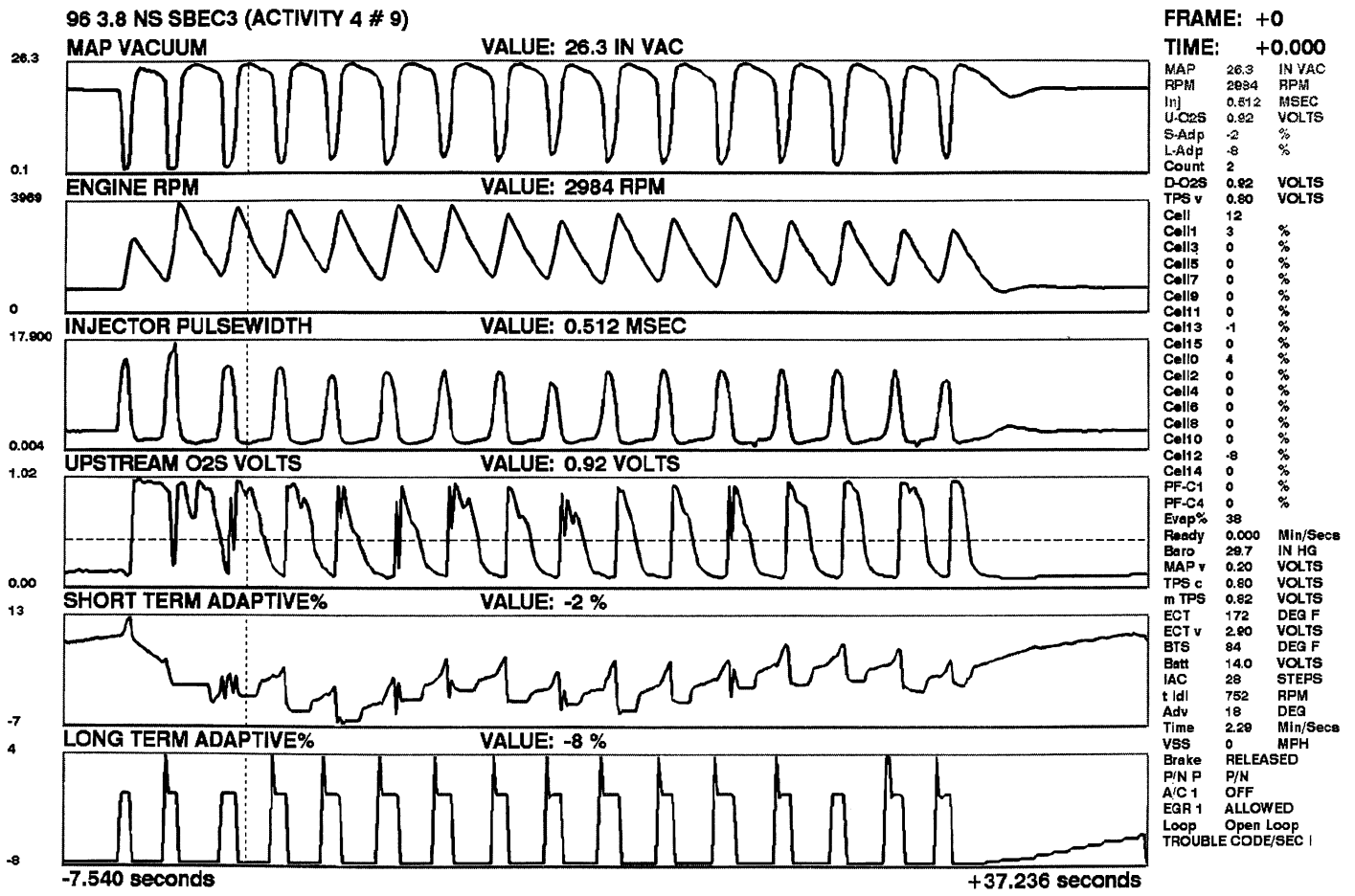
FRAME: +0
TIME: +0.000

MAP	20.2	IN VAC
TPS v	0.82	VOLTS
RPM	856	RPM
LL-Ad	-3	%
L-Inj	2.312	MSEC
L-O2S	0.08	VOLTS
Count	0	
R-Inj	2.312	MSEC
RL-Ad	-3	%
R-O2S	0.08	VOLTS
DIS	0	
Baro	29.6	IN HG
MAP v	1.20	VOLTS
TPS c	0.82	VOLTS
m TPS	0.82	VOLTS
ECT	206	DEG F
ECT v	2.22	VOLTS
BTS	93	DEG F
IAT	149	DEG F
IAT v	3.45	VOLTS
Batt	13.8	VOLTS
t Vlt	13.8	VOLTS
IAC	17	STEPS
t Idl	849	RPM
Adv	10	DEG
A/C v	1.12	VOLTS
A/C p	103.9	PSI
1 KSv	0.49	VOLTS
2 KSv	0.49	VOLTS
Retrd	0	DEG
VSS	0	MPH
Goal	0	MPH
SC On	OFF	
Set	RELEASED	
Vac	BLOCK	
Vent	BLEED	
Brake	RELEASED	
P/N P	P/N	
A/C	OFF	
Hi FC	OFF	
Lo FC	OFF	
EVAP	FLOWING	
EGR	BLOCKED	
CMP	YES	
CKP	YES	
ASD	ON	
VTA 1	FUEL	
VTA 2	NO	
Loop	CLOSED LOOP	
Man-T	OFF	

TROUBLE CODE/SEC |

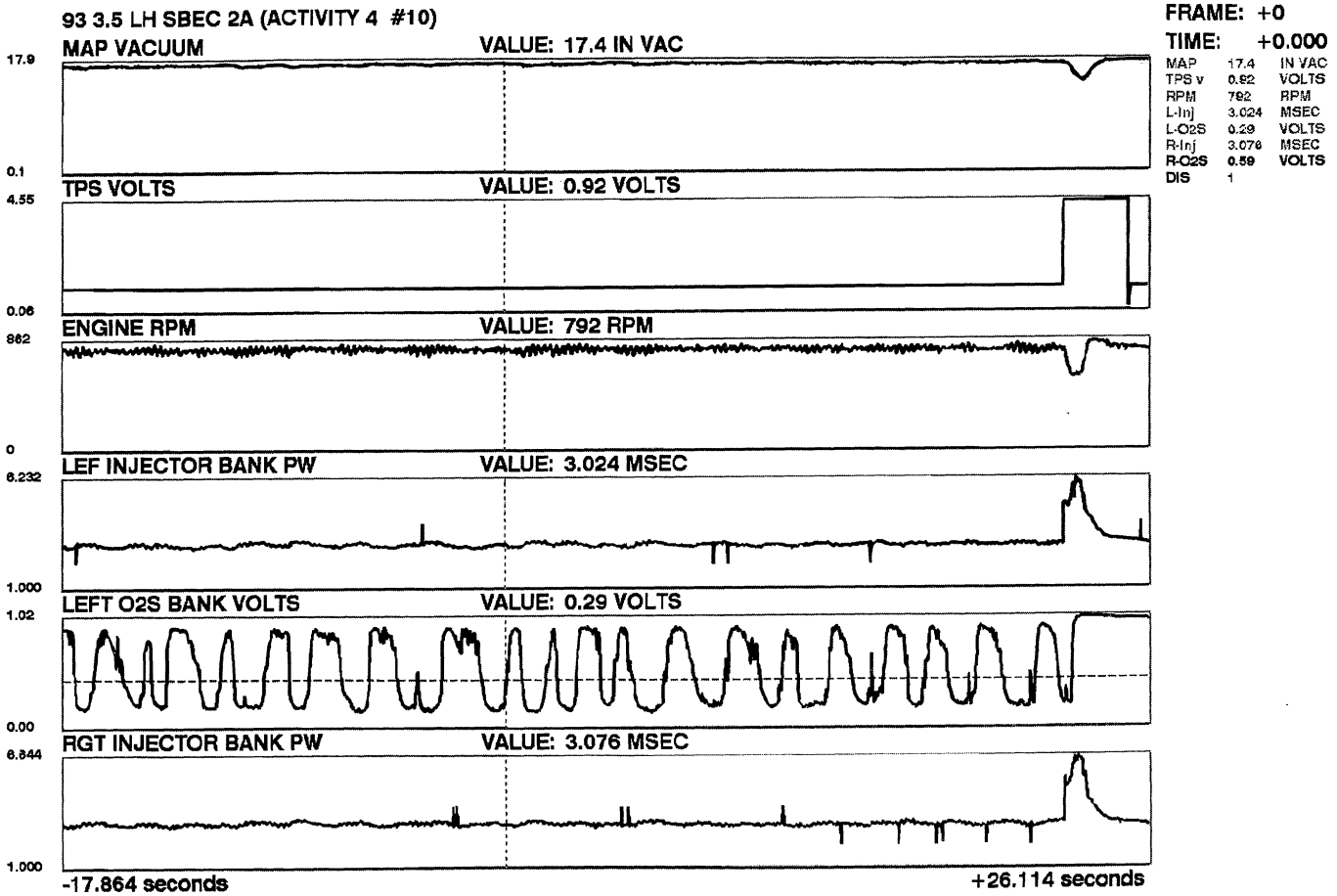
F3	MODE (MORE)	F1 LEFT	F2 RIGHT			ATM-PREV MENU		

MDS VEHICLE DATA DISPLAY	D3000-03



F3	MODE (MORE)	F1 LEFT	F2 RIGHT			ATM-PREV MENU		

MDS VEHICLE DATA DISPLAY	D3000-03



F3	MODE (MORE)	F1 LEFT	F2 RIGHT			ATM-PREV MENU		

LESSON FOUR

INTERPRETING OPERATING CONDITIONS

This section involves intermittent faults obtained from vehicles that were being driven.

MID RANGE ACCELERATION THROUGH GEARS (Fig. 21)

Purpose: Identify transmission shifts.

- Main focus - Engine RPM versus vehicle speed
- Shifts are reflected in map vacuum
- Some people tend let up on the throttle which tends to cloud the shift point. For example note the
  3 - 4 shift on the graph so watch TPS.
- Should always watch brake switch (can cause convertor to unlock at highway speed) if equipped with automatic transmission
- Should always watch Park Neutral switch (can cause PCM to use different fuel calculation programs)
- This information can be helpful when trying to verify MAP providing the driver was keeping the throttle in the light to mid range.

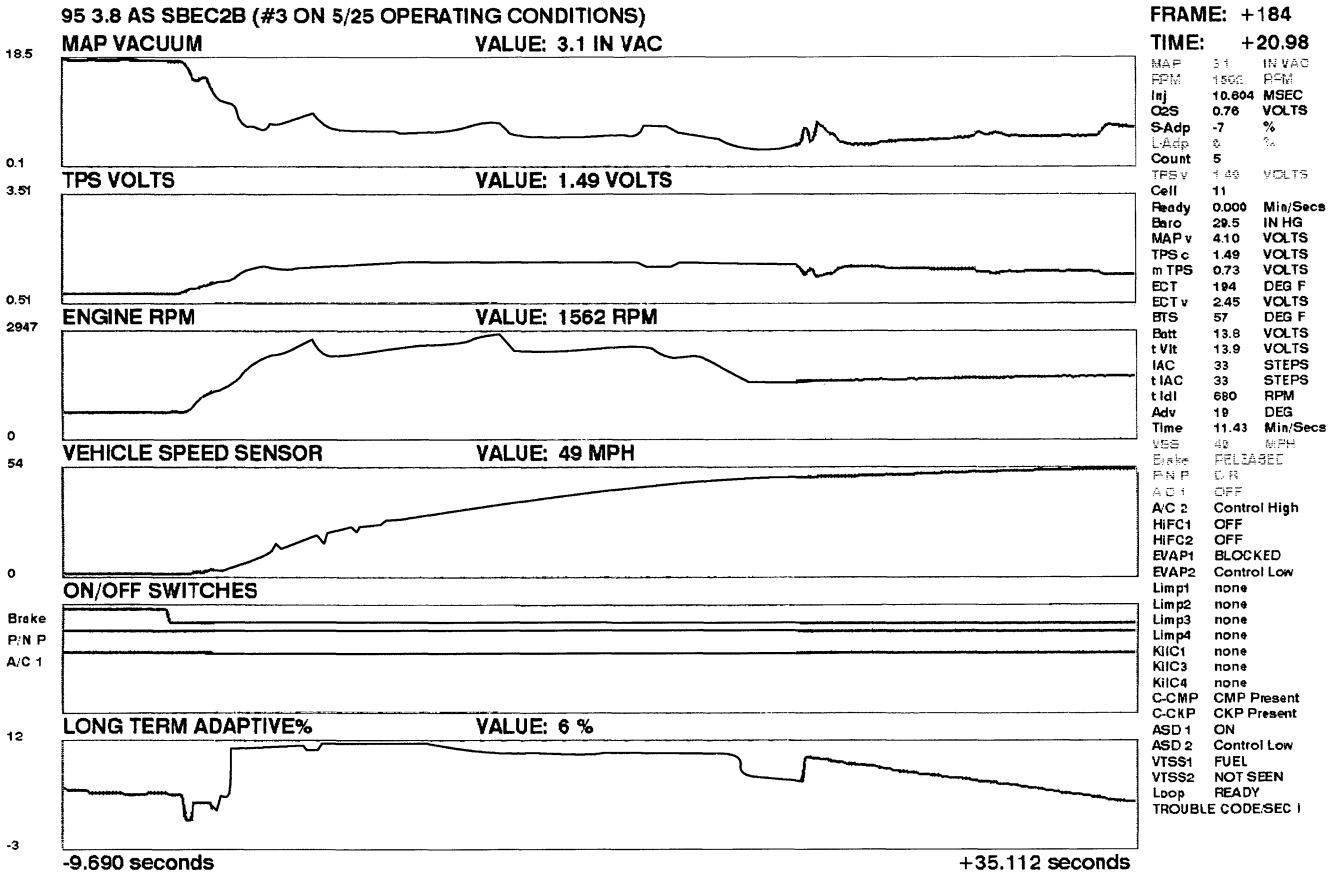


Fig. 21

Fuel Injection Data Recording

Wide Open Throttle Accelerate Through The Gears (Fig. 22)

- Map vacuum does not reflect or just barely reflects changes in engine load at WOT
- TCM will shift during lift foot condition if possible
- Engine RPM versus Vehicle speed patterns are more pronounced at WOT
- TPS can be at WOT with a displayed voltage as low as 3.5 volts approximately
- Should always watch brake switch (can cause convertor to unlock at highway speed)
- Should always watch Park Neutral switch
  (can cause PCM to use different fuel calculation)

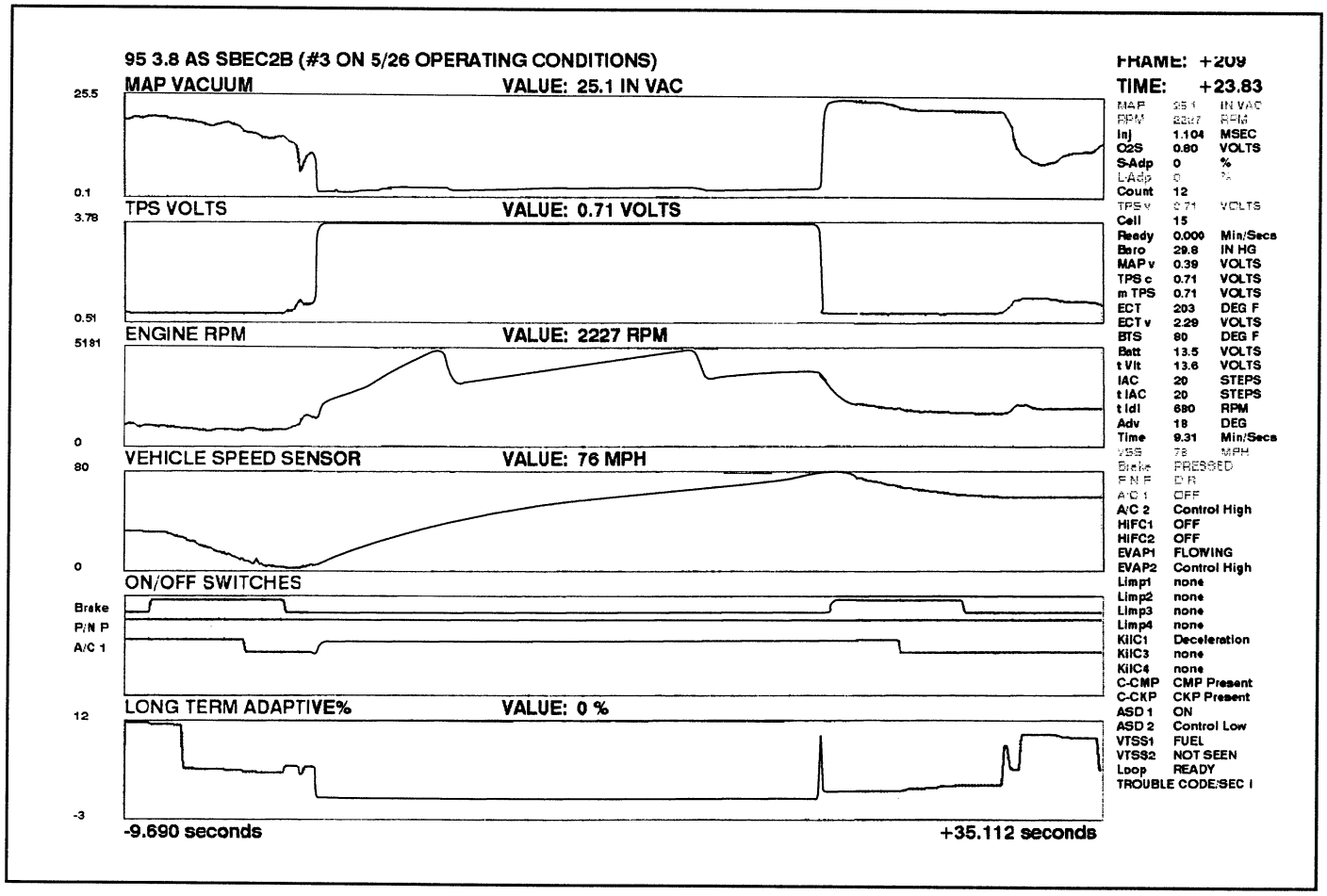


Fig. 22

Slight Up Hill/Down Hill Throttle Held Steady (Fig. 23)

- Map vacuum will change when the grade changes.
- This may cause the PCM to operate out of a different long term memory cell.
- In this graph vehicle speed and MAP change with the grade while TPS and RPM are almost flat. However, most drivers tend to compensate by changing throttle. This results in an almost flat vehicle speed line with greater changes in RPM (possible down shift), TPS and MAP. So it is possible to Identify uphill down hill by finding these conditions.

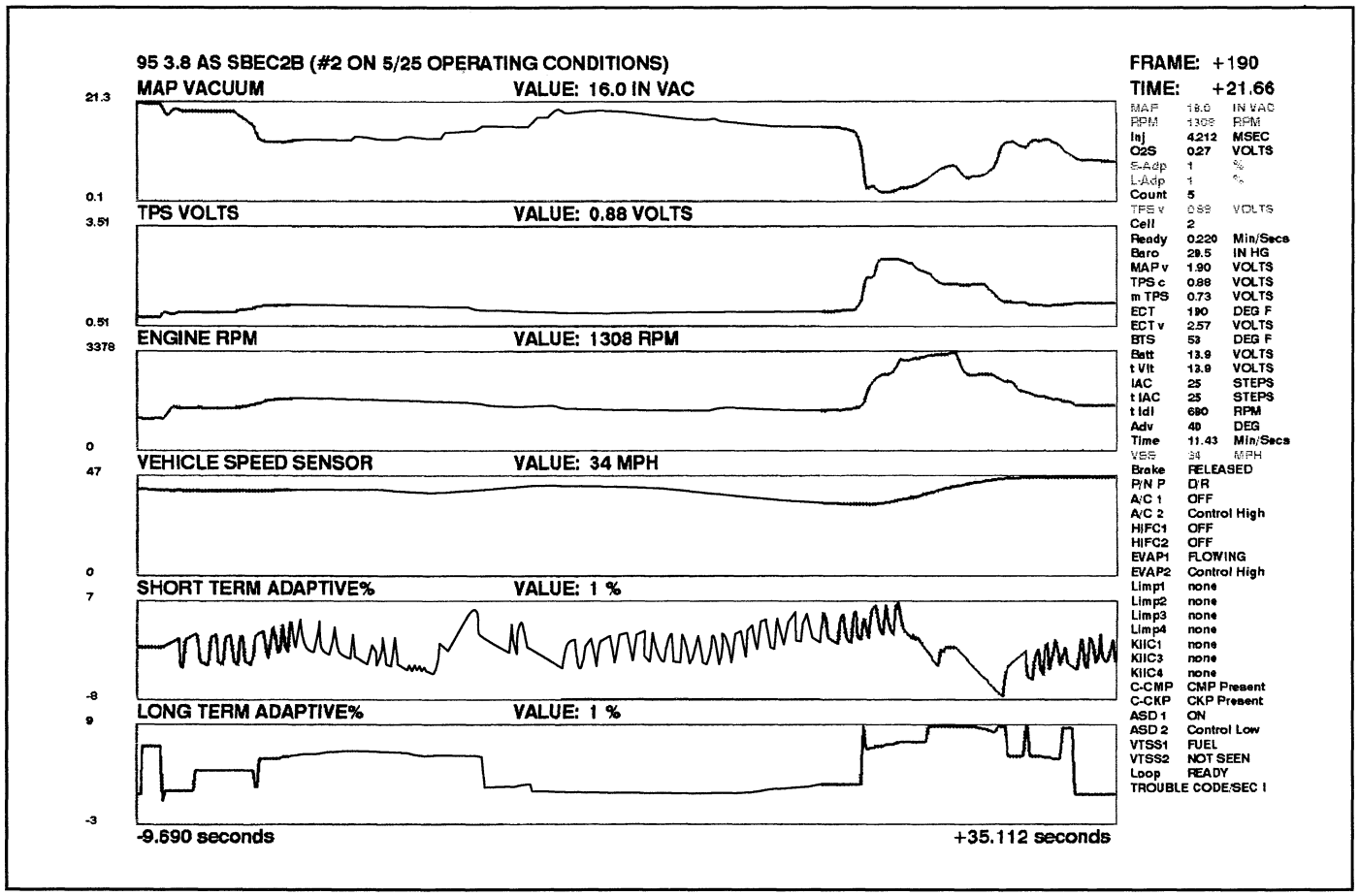


Fig. 23

Deceleration With Brake Assist (Fig. 24)

- Downshifts **may be** hard to detect with automatic transmissions because the torque convertor tends to absorb them.
- Some decelerations happen with the throttle open (2 footed driver watch brake switch to identify this)
- A park/neutral switch problem is indicated if a change of state is observe without verification in MAP and RPM.
- PCM uses IAC to control manifold vacuum during deceleration.
- Rate of deceleration will depend primarily on the amount of force used to apply the brakes and the condition/grade of the surface the vehicle is on.

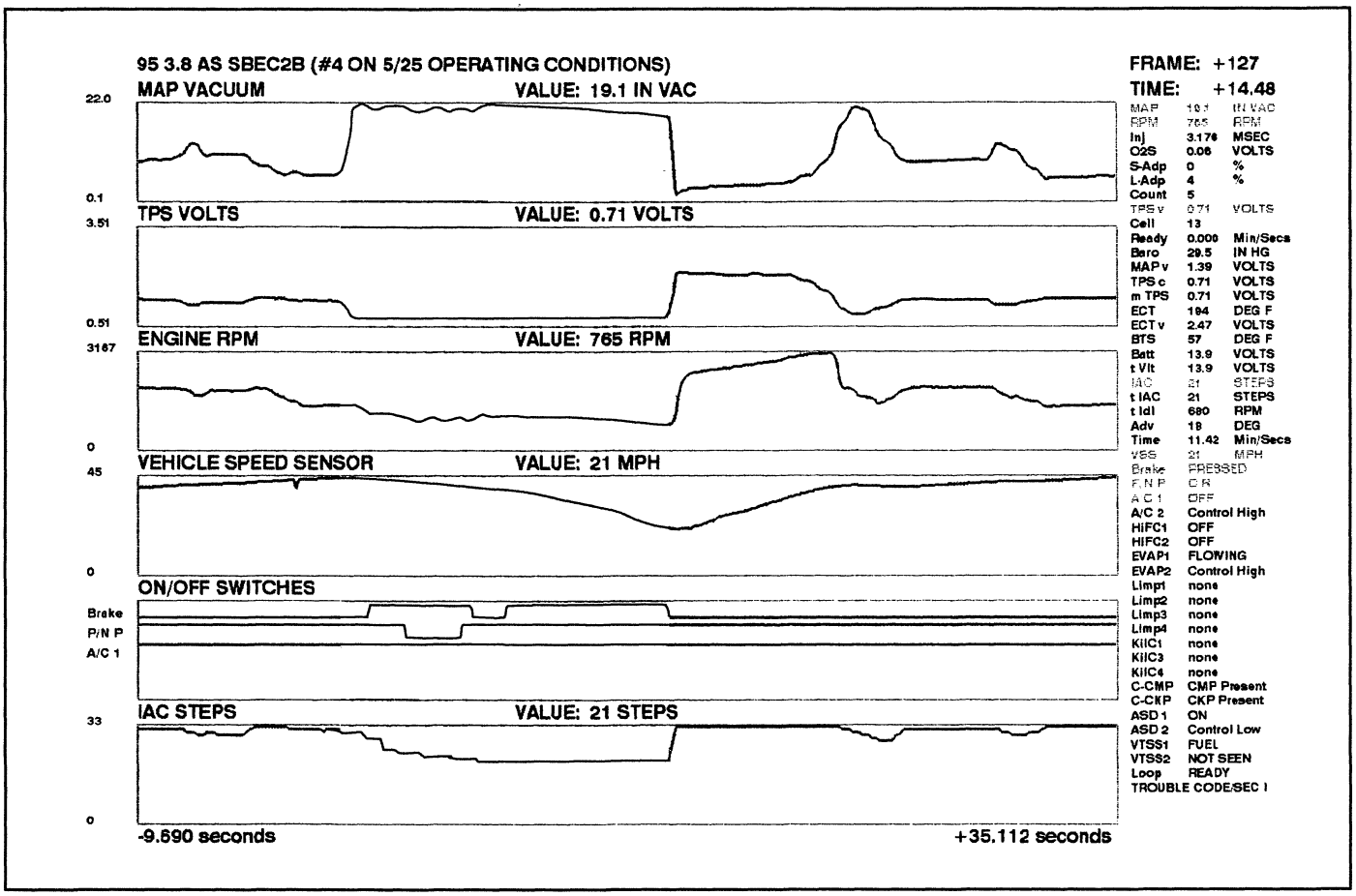


Fig. 24

A/C On/Off, Coolant and Battery Temperature Sensor (Fig. 25)

- The PCM prevents A/C on/off from being felt by most drivers because it moves the IAC in and out to compensate for engine load.
- The A/C clutch turning on and off may show up in MAP. However, there are many times this is not discernable.
- To verify current state, move the line to the point in question and look at the list on the side of the graphs.
- Comparing coolant and battery temperature sensor can validate sensor operation providing the vehicle has set for 7 hours.
- Although battery temperature sense is generally warmer than ambient by a few degrees it can tell us how cold or hot it was when the recording was made.

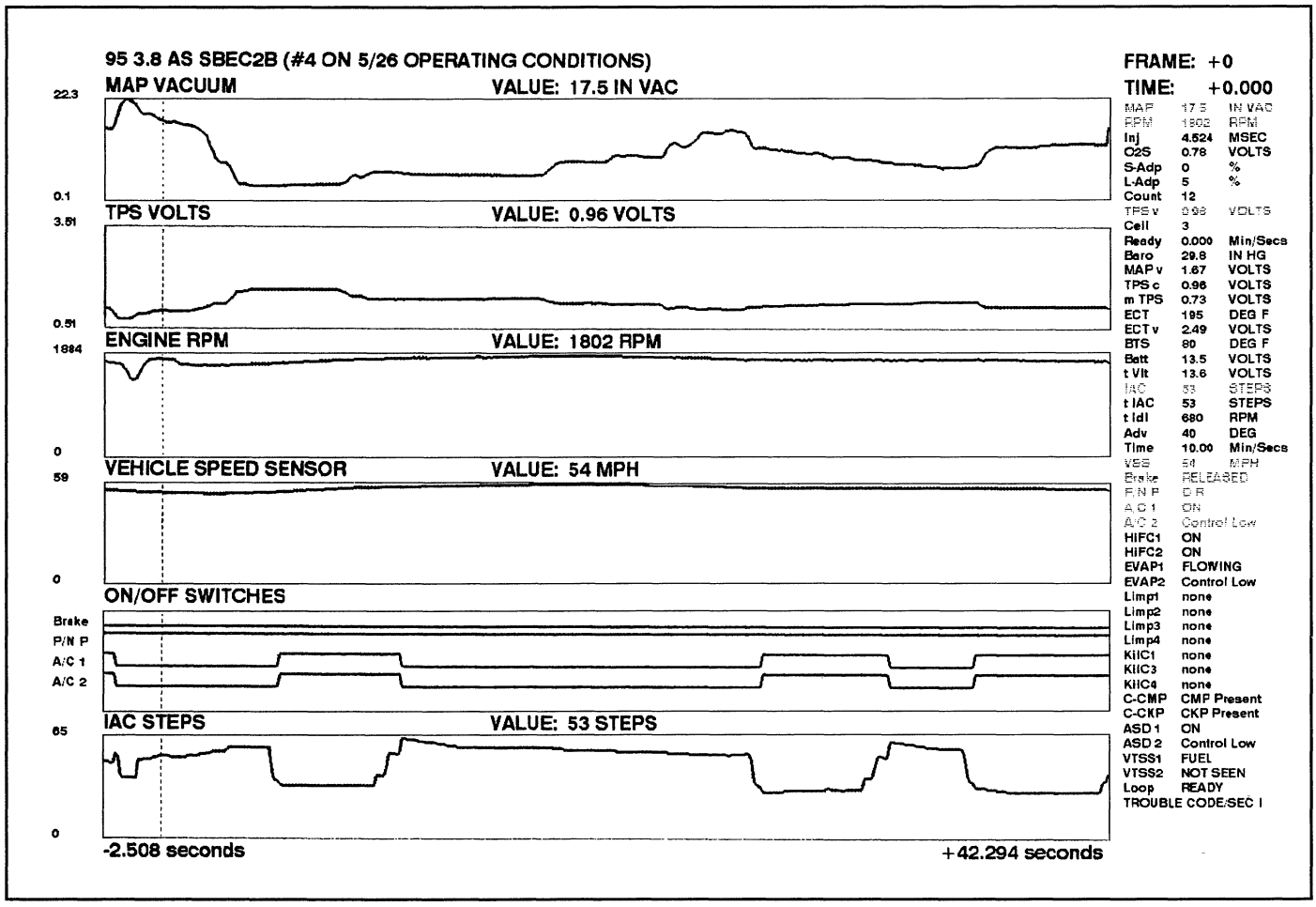


Fig. 25

Fuel Injection Data Recording

Temperature

- After a vehicle has cooled for approximately 7 hours, the temperature sensors (battery, intake, air and coolant) should match within 10 degrees.
- If a component is temperature sensitive and the customer brings you a data recording where the temperature is something other than a normal operating temperature, then it should be approximately the same between three recordings.
- Coolant temperature can be verified by looking at battery temperature IF the conditions of item one can be met and the problem occurs within the first 45 seconds of operation.

Activity 5

Identifying Operating Conditions

This activity will focus on identifying the operating conditions under which this was made. Each MDS has five recordings named Activity 5 #1 ... #5. Paper copies of the data recordings are attached. However, it maybe necessary to display the recording to answer the questions in each section.

1. a. What was the TPS value? Variable between _____v. & _____v. or steady at v.

   b. What was the MAP value? Variable between _____in. & _____in. or steady at in.

   c. What was the coolant temp. sensor value at the start of the graph? _____degrees

   d. What was the battery temp. sensor value at the start of the graph ? _____degrees or _____volts

   e. What was the vehicle speed? Variable between _____MPH & _____MPH or steady at _____MPH

   f. Did the transmission appear to have shifted gears ? _____ If yes how many times? _____

   g. Were the brakes applied? No____ Yes____ NA____

   h. Was the A/C on ? _____ Was the clutch engaged according to the PCM? _____

   i. Was the vehicle in drive for the entire recording? No_____ Yes_____ NA_____

   j. In conclusion what was the vehicle doing at the time of the recording?
   _____
   _____
   _____

2. a. What was the TPS value? Variable between _____v. & _____v. or steady at _____v.

   b. What was the MAP value? Variable between _____in. & _____in. or steady at in.

   c. What was the coolant temp. sensor value at the start of the graph ? _____degrees

   d. What was the battery temp. sensor value at the start of the graph ? _____degrees or _____volts

   e. What was the vehicle speed? Variable between _____MPH & _____MPH or steady at _____MPH

f. Did the transmission appear to have shifted gears ? _____ If yes how many times? _____

g. Were the brakes applied? No____ Yes____ NA____

h. Was the A/C on ? _____ Was the clutch engaged according to the PCM?

i. Was the vehicle in drive for the entire recording? No___ Yes_____ NA____

j. In conclusion what was the vehicle doing at the time of the recording?

_____

_____

_____

_____

3. a. What was the TPS value? Variable between _____v. & _____v. or steady at v.

b. What was the MAP value? Variable between _____in. & _____in. or steady at _____in.

c. What was the coolant temp. sensor value at the start of the graph ? _____degrees

d. What was the battery temp. sensor value at the start of the graph ? _____degrees or _____volts

e. What was the vehicle speed?. Variable between ____MPH & _____MPH or steady at _____MPH

f. Did the transmission appear to have shifted gears ? ___ If yes how many times? _____

g. Were the brakes applied? No____ Yes____ NA____

h. Was the A/C on? ____ Was the clutch engaged? ____

i. Was the vehicle in drive for the entire recording? No___ Yes____ NA____

j. In conclusion what was the vehicle doing at the time of the recording? _____

_____

_____

4. a. What was the TPS value? Variable between _____v. & _____v. or steady at _____v.

b. What was the MAP value? Variable between _____in. & _____in. or steady at _____in.

c. What was the coolant temp. sensor value at the start of the graph ? _____degrees

d. What was the battery temp. sensor value at the start of the graph ? _____degrees or _____volts

e. What was the vehicle speed? Variable between ____MPH & _____MPH or steady at _____MPH

f. Did the transmission appear to have shifted gears? _____ If yes how many times? _____ (Instructor Note: shifted when throttle was released.)

g. Were the brakes applied? No____ Yes____ NA___

h. Was the A/C on ? _____ Was the clutch engage according to the PCM?_____

i. Was the vehicle in drive for the entire recording? No____ Yes____ NA____

j. In conclusion what was the vehicle doing at the time of the recording? _____

_____

_____

_____

5. a. What was the TPS value? Variable between _____v. & _____v. or steady at _____v.

b. What was the MAP value? Variable between _____in. & _____in. or steady at _____in.

c. What was the coolant temp. sensor value at the start of the graph ? _____degrees

d. What was the battery temp. sensor value at the start of the graph ? _____degrees or _____volts

e. What was the vehicle speed?. Variable between _____MPH & _____MPH or steady at _____MPH

f. Did the transmission appear to have shifted gears ? _____ If yes how many times? _____

g. Were the brakes applied? No____ Yes____ NA_____

h. Was the A/C on ? _____ Was the clutch engage according to the PCM?_____

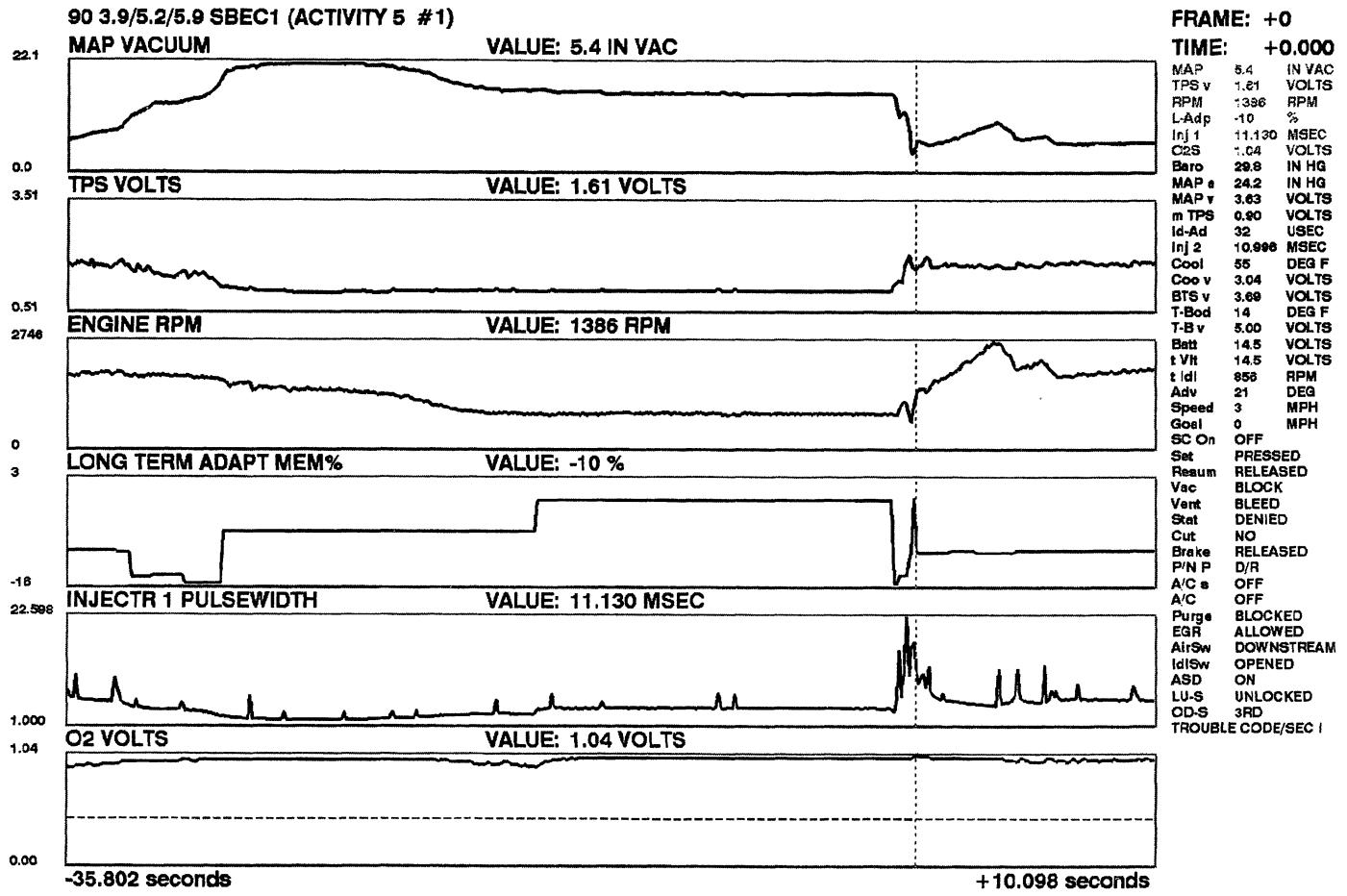
i. Was the vehicle in drive for the entire recording? No____ Yes_____ NA____

j. In conclusion what was the vehicle doing at the time of the recording? _____

_____

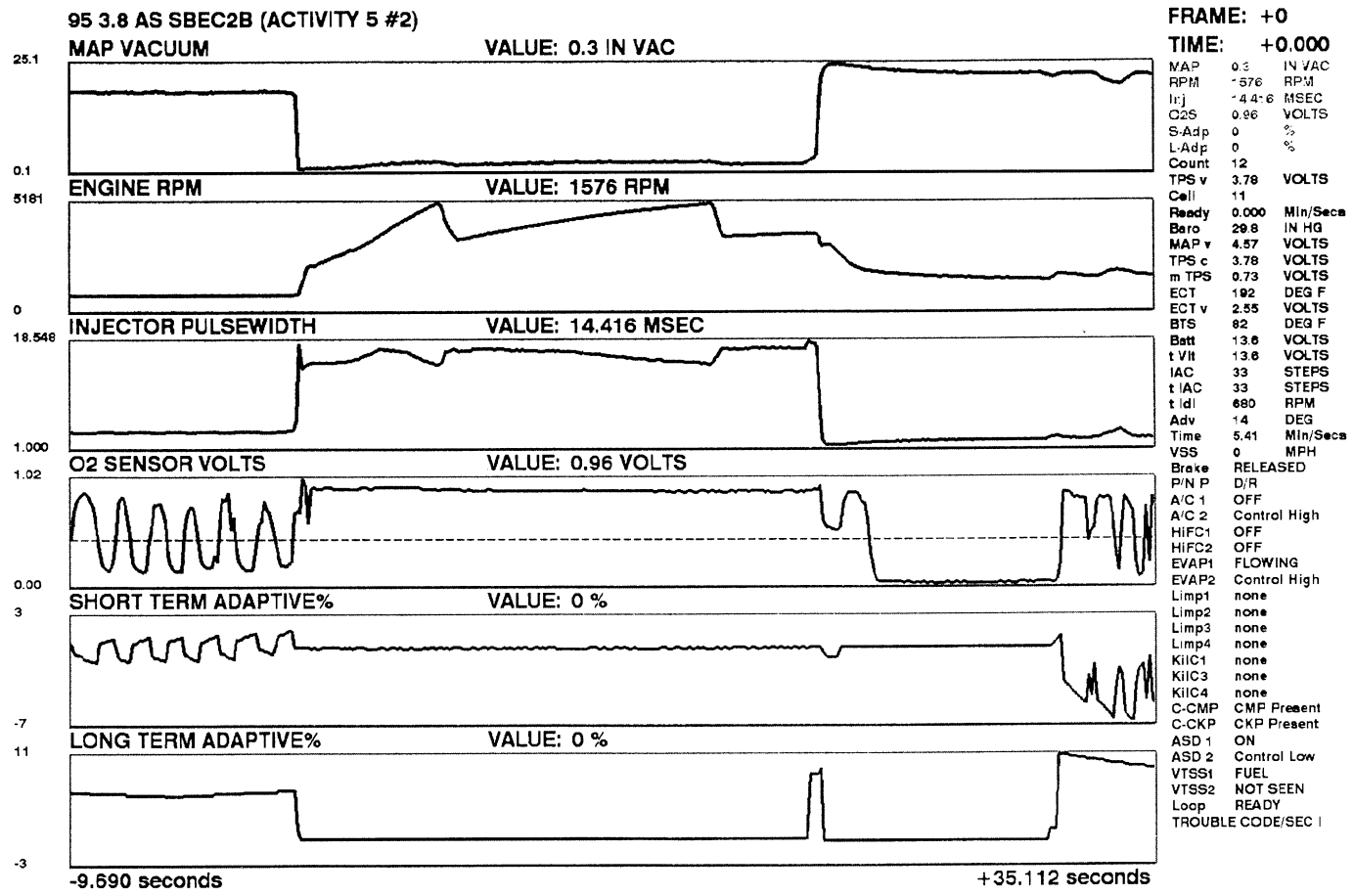
_____

MDS VEHICLE DATA DISPLAY	D3000-03



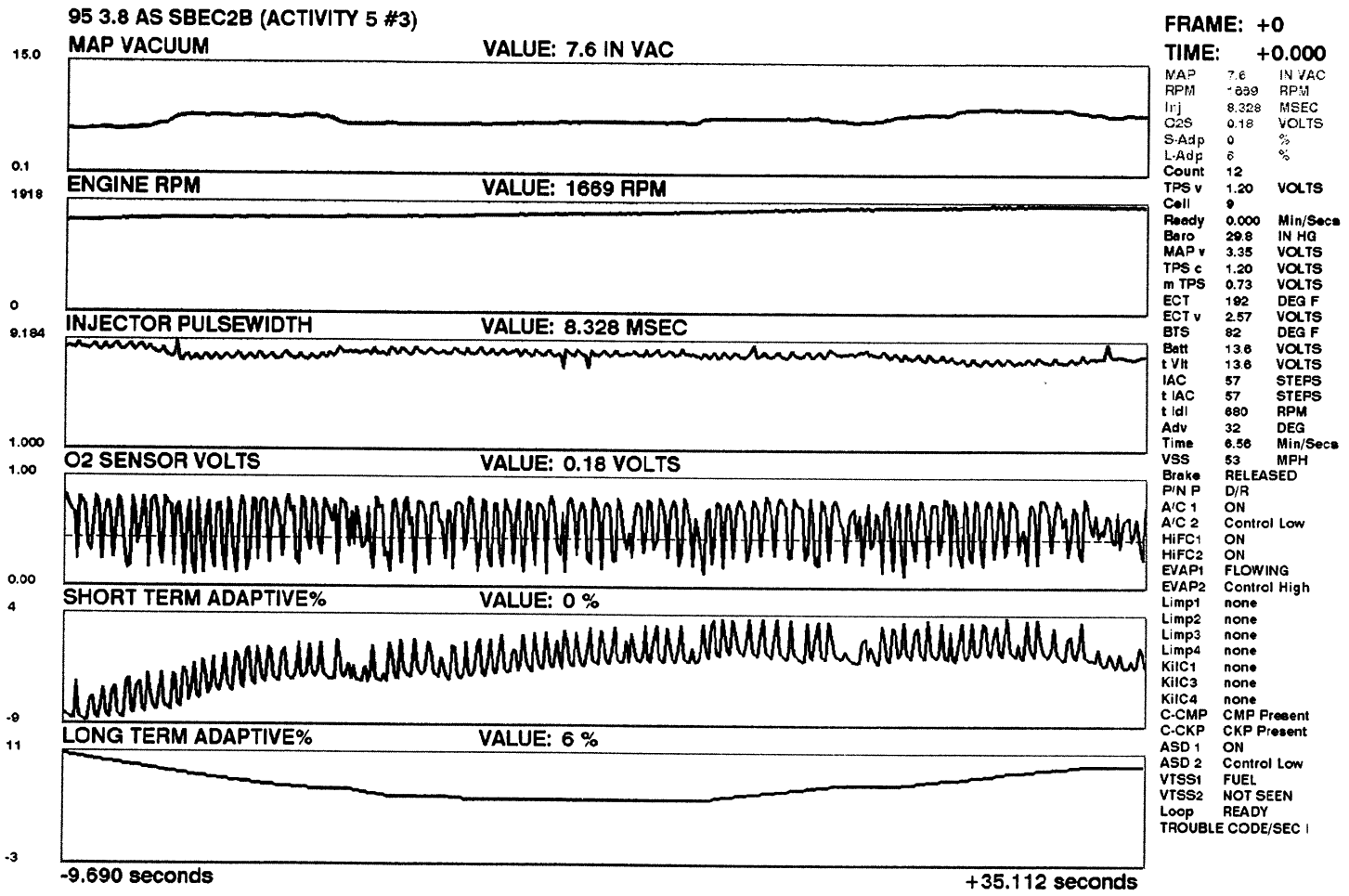
F3 HELP	MODE (MORE)	F4 SELECT GRAPH	MAIN MENU	F6 PAGE PRINT	F7 SCALE	F8 RE-STORE	F9 ZOOM	

MDS VEHICLE DATA DISPLAY	D3000-03



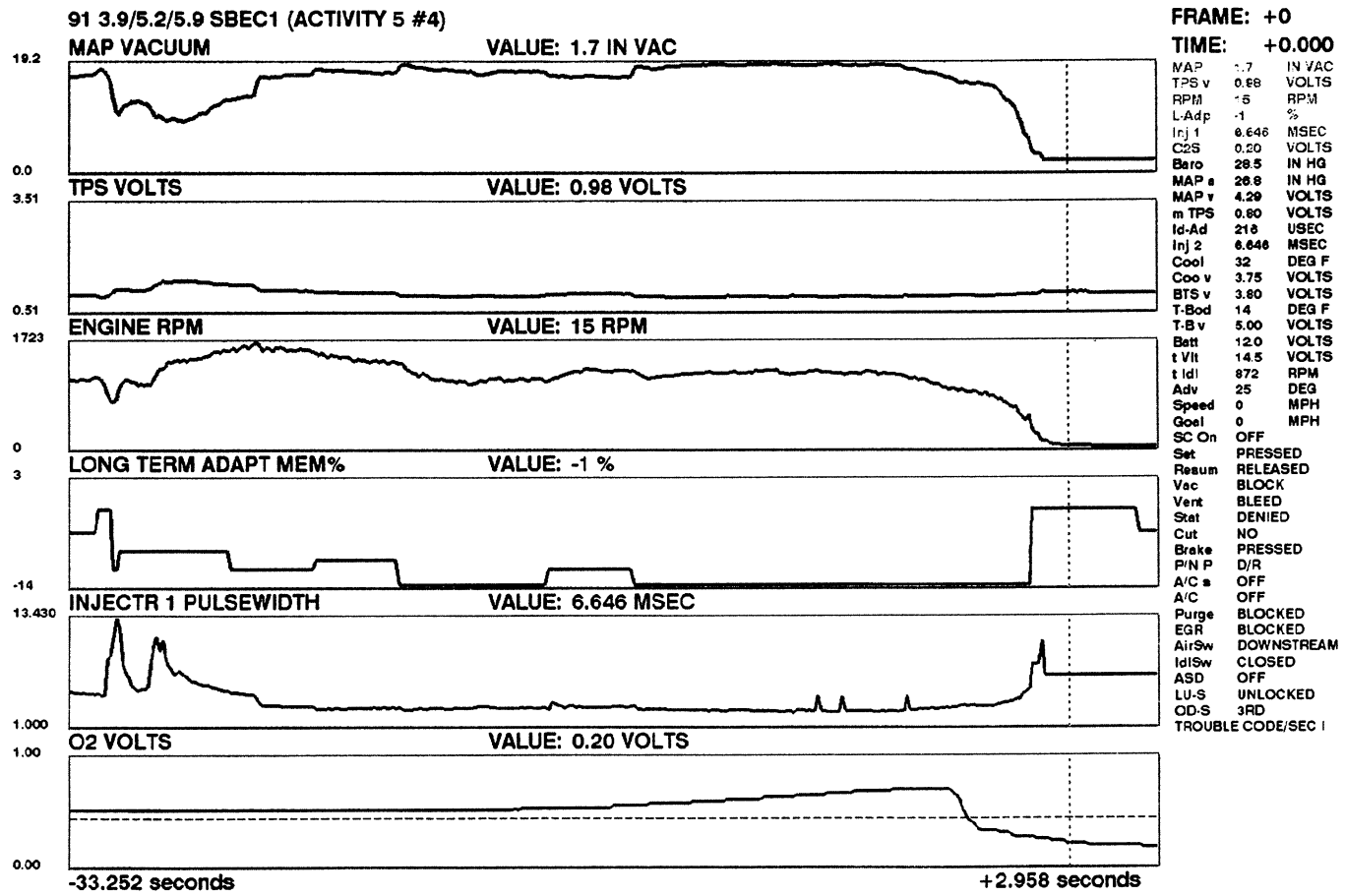
F3 HELP	MODE (MORE)	F4 SELECT GRAPH	MAIN MENU	F6 PAGE PRINT	F7 SCALE	F8 RE-STORE	F9 ZOOM	

MDS VEHICLE DATA DISPLAY	D3000-03



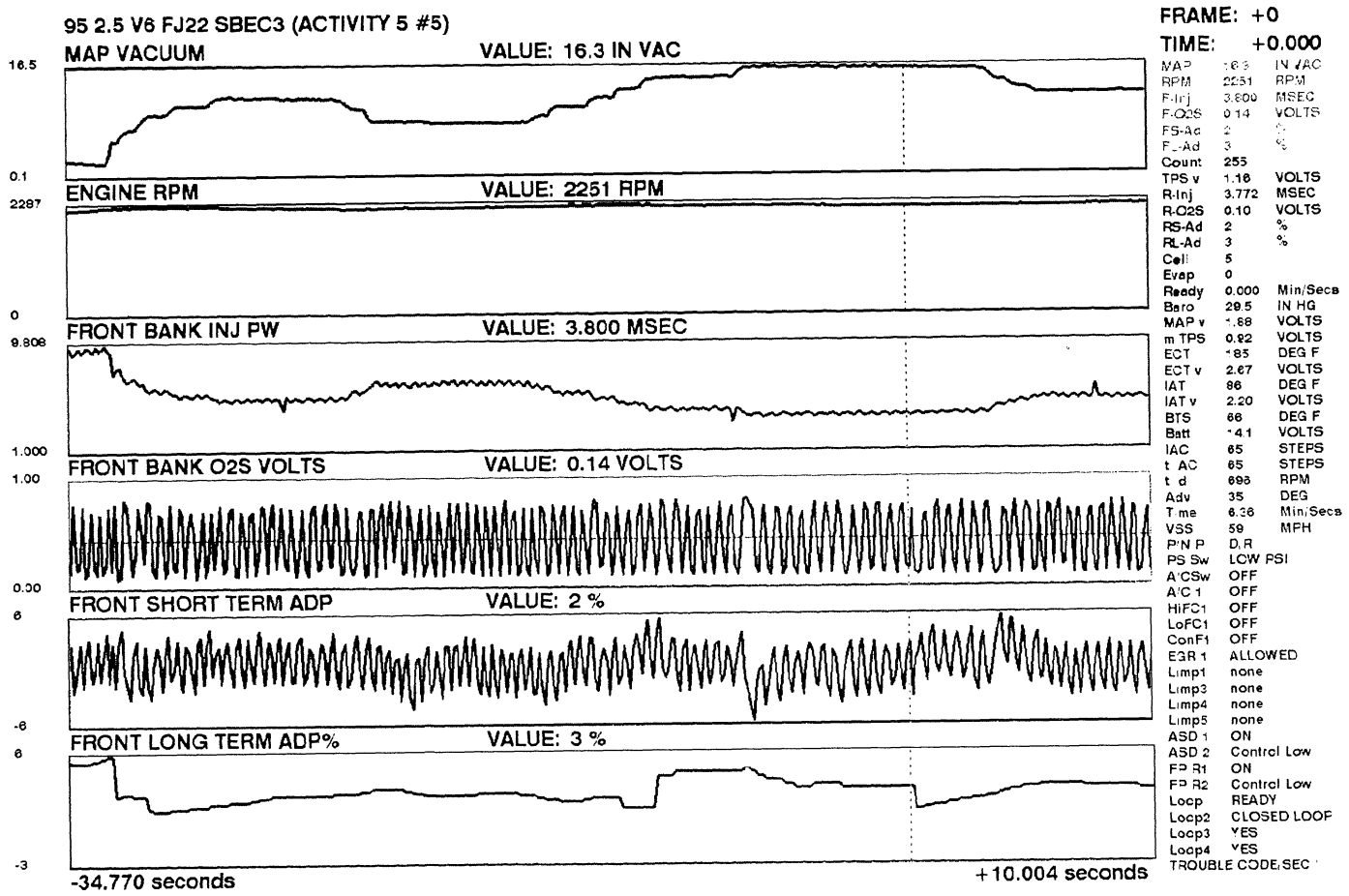
F3 HELP	MODE (MORE)	F4 SELECT GRAPH	MAIN MENU	F6 PAGE PRINT	F7 SCALE	F8 RE-STORE	F9 ZOOM	

MDS VEHICLE DATA DISPLAY	D3000-03



F3 HELP	MODE (MORE)	F4 SELECT GRAPH	MAIN MENU	F6 PAGE PRINT	F7 SCALE	F8 RE-STORE	F9 ZOOM	

MDS VEHICLE DATA DISPLAY	D3000-03



F3 HELP	MODE (MORE)	F4 SELECT GRAPH	MAIN MENU	F6 PAGE PRINT	F7 SCALE	F8 RE-STORE	F9 ZOOM	

Activity 6

USING TEMPLATES

In this exercise you will make a template in the first section of the activity. The second section will be changing a template that does not have events attached to it (has not been used to make recordings yet). The third section will be loading the custom template that was just completed. Make one recording and return to MDS to upload it.

SECTION 1

1. Select Make or Change Templates from the Data Recorder Main Menu.

2. Enter the following Tech I.D. "Sue" VIN for vehicle being recorded. Repair Order (RO) number is 727 and the mileage is 7045.

3. What key should you press to continue? Write down its name.

4. Then select Make Template from the next menu.

5. Next choose 5 items. What key is used to select/deselect items?

6. Write down the frame time which is found in the upper right hand corner. Name the Template with a descriptive name and press

SECTION 2

1. Select Change Template from the Templates Menu.

2. Next find the template that was just created in the last section. List the steps necessary to select it.
   1.
   2.

3. Are the items originally selected to record now shown on the screen?

4. To continue, what key should you press?

5. Add 3 new items to the list of items to be recorded.
   (a) What key is used to select/deselect items?
   (b) What key is used to progress to the next screen?

6. On this screen you may change the name if you wish. Locate the frame time found in the upper right hand corner. Did it stay the same as note in step 5?
   (a) If not was it greater than or less than step 5?
   (b) Why?

Activity 6

SECTION 3

1. Upon returning to the Data Recorder Main Menu what should you select to load the template just created?

2. Were you able to find the template created in section #2?

3. After selecting your template and pressing next menu, does the screen show a list of items you choose to be recorded in sections 1 and 2?

4. Before pressing next menu at the screen mentioned in question 3, hook up DRB III to the MDS. Which menu option should be selected on DRB III before you are ready to continue?

5. When the DRB III screen displays "Make selection using DRB III or MDS keyboard (see MDS screen) press shift F1 to exit to Main Menu" you are ready to continue. Use the DRB key pad to operate MDS. This verifies communication between the DRB and MDS. Complete programming the DRB III.

6. Disconnect DRB III from the MDS. Make 1 recording using the vehicle assigned to you. Upload the recording you just made. Were you able to upload the recording in the MDS?

LESSON SIX

SETUP TRIGGERS

The "Setup Triggers" option allows you to define how the Data Recorder will be triggered to capture events. The Data Recorder is constantly sampling data from the sensors and switches defined in the template. It is only when you press a key on the Scan Tool or Co-pilot that the Data Recorder captures the event.

Pressing a key is called "Manual Triggering." This is the default setting, but is only one of three ways you can trigger an event. The other two ways of triggering the Data Recorder are by Sensor and Trouble Code.

Trigger By Sensor

In some cases, pressing a key on the Scan tool is not the best way to capture and event, especially if the event is not noticeable during normal driving conditions. The MDS will allow you to change the Data Recorder from the default Manual Trigger to Automatic Triggers.

Automatic triggers monitor any sensor or switch in the template and trigger when the output of that sensor or switch fall within a certain range which you define.

The MDS will allow you to select one sensor of your choice on which to trigger. There are two values you must enter, the Trigger Above Voltage and the Trigger Below Voltage. The default values provide typical maximum and minimum values at which you would want to trigger. You can change either of those voltages to any legal sensor voltage. The MDS may "round" the numbers that you enter slightly. This is normal.

Trigger By Trouble Codes

You can also set up to automatically trigger on a secondary indicator or hard code. This option is useful for the Data Recorder to trigger when a specific code is generated and stored in the Powertrain Control Module (PCM).

Secondary indicator are maturing fault codes. They are faults that the PCM initially detects but has not, as yet, upgraded to hard fault codes. Several secondary indicators are set during normal operation due to changes in operating conditions.

However, if the fault condition is not present for a long enough period of time, then the PCM resets these secondary indicator. When a secondary indicator has been detected repeatedly by the PCM, then the PCM will change the secondary indicator to a hard code.

Hard codes indicate that the PCM has detected the fault for a long enough time to consider it an actual fault. You may wish to use secondary indicator to catch an intermittent failure, or a code that may not occur for a long enough time to generate a hard code.

You may select triggering on "Any Secondary Indicator" or "Select Secondary Indicators." If you select "Any Secondary Indicator," the Data Recorder will trigger whenever any secondary indicator is generated.

Because some secondary indicators are commonly set during normal operation, if you trigger on any secondary indicator, you may trigger prematurely when there is actually no real fault present.

The MDS will display all the possible secondary indicators for that model year, engine and PCM combination.

Activity 7

USING AUTOMATIC TRIGGERS

In this exercise you will set up the DRB II or DRB III to trigger automatically. First program the trigger, then program the DRB to make a recording. Make one recording and return to the MDS to upload it.

1. What menu heading did you select from the Data Recorder Main menu?

2. What type of trigger did you select for use?
   A.
   B.
   C.

3. Fill in the blanks below and skip to step #6.
   A. Which sensor did you select?_____

   _____

   B. What were the upper and lower limits you choose?_____

   _____

4. After choosing C of step 2, what is your next choice?

5. What is the difference between a secondary indicator and a hard code?

6. Finish selecting your auto trigger. Upon returning to the Data Recorder Menu what type of trigger is shown next to the engine size at the top?

7. Next, choose a recording tool and a vehicle to record. Be sure the correct VIN is entered on the MDS. Program the DRB and make some recordings. Could you make the recording trigger automatically?

8. Upload and display your recordings. How far away is the trigger line from the point in the graph which caused the trigger?

GLOSSARY

Short name	Long name	Units
A/C p	A/C HI-SIDE PRESSURE	PSI
A/C v	A/C HI-SIDE VOLTS	VOLTS
L-Adp	LONG TERM ADAPT MEM%	%
Id-Ad	IDLE ADAPTIVE US	MICROSEC.
Id-Ad	IDLE ADAPTIVE MEMORY	MICROSEC.
AIS	AIS POSITION	STEPS
Baro	BAROMETRIC PRESSURE	IN HG
BTS	BAT TEMP SENSOR DEG	DEG F
BTS v	BAT TEMP SENSOR VOLT	VOLTS
TTemp	TRANS TEMP SENSOR	DEG F
TTmpv	TRANS TEMP SEN VOLTS	VOLTS
TTemp	TRANS TEMP SENSOR	DEG F
TTmpv	TRANS TEMP SEN VOLTS	VOLTS
BTS	BAT TEMP SENSOR DEG	DEG F
TTemp	TRANS TEMP SENSOR	DEG F
Boost	BOOST GOAL	PSI
Cam	1 TIME CAM EDGE SEEN - CAM SENSOR COUNTER BASED ON EDGES OF HAD EFFECT SWITCHES USED ON 92 3.9/5.21 ENGINES	
CMP	CAM TIMING POSITION - CAM TIMING IN RELATIONSHIP W/THE BELT BASED ON DEG. WILL IDENTIFY FOR EXAMPLE TIMING BELT SKIPPED ONE TOOTH.	DEG
Charg	CHARGE TEMP SEN DEG	DEG F
Chg v	CHARGE TEMP SEN VOLT	VOLTS
FPr v	CNG FUEL PRESS VOLTS	VOLTS
FPres	CNG FUEL PRESSURE	PSI
FTemp	CNG FUEL TEMPERATURE	DEG F
FTmpV	CNG FUEL TEMP VOLTS	VOLTS
TANKG	FUEL LEVEL GALLONS	Gallons
TANKV	FUEL LEVEL VOLTS	Volts
Cool	COOLANT SENSOR DEG	DEG F
Coo v	COOLANT VOLTS	VOLTS
DIS DIS Cy ID Ign C	DIS COUNTER DIS CYLINDER CYLINDER ID NUMBER IGNITION COUNTER	ALL THESE ARE COUNTERS BASED ON CAM OR CRANK SENSORS OR BOTH. THEY COUNT ALL THE TIME WHILE ENG IS RUNNING.
RPM	ENGINE RPM	RPM
FFRPM	FREEZ FRAME RPM	RPM
FFS v	FLEX FUEL SEN VOLTS	VOLTS
Inj 1	INJECTR 1 PULSEWIDTH	MSEC
Inj 2	INJECTR 2 PULSEWIDTH	MSEC
Inj	INJECTOR PULSEWIDTH	MSEC
Knk v	KNOCK SENSOR VOLTS	VOLTS
Crk 1 Crk 2	LAST CRNK EDGE CNT#1 LAST CRNK EDGE CNT#2	ALL THESE ARE COUNTERS BASED ON CAM OR CRANK SENSORS OR BOTH. THEY COUNT ALL THE TIME WHILE ENG IS RUNNING.
MAP a	MAP ABSOLUTE	IN HG
FFMAP	FREEZ F ABSOLUTE MAP	IN HG
MAP b	MAP BOOST	PSI
MAP	MAP VACUUM	IN VAC
MAP V	MAP VOLTS	VOLTS
M TPS	MINIMUM TPS	VOLTS
O2S	O2 VOLTS	VOLTS
FFV %	FLEX FUEL % METHANOL	%
Ret 1	RETARD CYLINDER 1	DEG
Ret 2	RETARD CYLINDER 2	DEG
Ret 3	RETARD CYLINDER 3	DEG
Ret 4	RETARD CYLINDER 4	DEG
GOAL	S/C SET SPEED	MPH
S/C v	S/C SWITCH VOLTS	VOLTS
Adv	SPARK ADVANCE	DEG
Speed	SPEED SENSOR	MPH
FFVSS	FREEZ F VEHICLE SPD	MPH
T-Bod	T-BODY TEMP SEN DEG	DEG F
T-B v	T-BODY TEMP SEN VOLT	VOLTS
t AIS	TARGET AIS	STEPS
T VLT	TARGET CHARGING VOLT	VOLTS
T IDL	TARGET IDLE	RPM
t Idl	TARGET IDLE	RPM
Retrd	TOTAL RETARD	DEG
RET	OVERALL KNOCK RETARD - OVERALL BASE SPARK ADVANCE RETARD BASED ON KNOCK SENSOR INPUT.	DEG
TPS V	TPS VOLTS	VOLTS
TPS C	TPS CALCULATED VOLTS	VOLTS
VNT 2	VNT #2 DUTY CYCLE 1990 TURBO 4	%
VNT 3	VNT #3 DUTY CYCLE 1990 TURBO 4	%
Fan %	FAN DUTY CYCLE	%
Dwel1	DWELL COIL#1 CYL#1&4	mSec
Dwel2	DWELL COIL#2 CYL#2&3	mSec
Dwel2	DWELL COIL#2 CYL#2&5	mSec
Dwel3	DWELL COIL#3 CYL#3&6	mSec
BATT	VOLTAGE SENSE	VOLTS
WGate	WASTEGATE DUTY CYCLE	%
WIF v	WATER IN FUEL VOLTS	VOLTS
Cat	CATALYST EFFICIENCY	
O2S M	O2 SENSOR MONITOR	
C Mis	CYLINDER MISFIRE	
S Air	SECONDARY AIR	
EFlow	EVAP PURGE FLOW	
Evap	EVAP PURGE DUTY CYCL	%
EVAP%	PURGE DUTY CYCLE	%
IAC	IAC STEPS	STEPS
IAT	INTAKE AIR TEMP DEG	DEG F
IAT V	INTAKE AIR TEMP VOLT	VOLTS
ECT	ENG COOLANT TEMP DEG	DEG F
ECT V	ENG COOLANT TEMP VOLTG	VOLTS
COUNT	NEWEST DTC COUNTER	

GLOSSARY

F-DTC	DTC THAT CAUSED FRZF	
Cell	ADAPT FUEL CELL ID	
L-Cel	LEFT ADAPT CELL ID	
R-Cel	RGHT ADAPT CELL ID	
F-Cel	FRNT ADAPT CELL ID	
R-Cel	REAR ADAPT CELL ID	
CELL	CURRENT ADAP CELL ID	
Id-Ad	IDLE ADAPTIVE US	MICROSEC.
L-Idl	LEFT IDLE ADAP BANK	MICROSEC.
R-Idl	RIGHT IDLE ADAP BANK	MICROSEC.
F-Idl	FRONT IDLE ADAP BANK	MICROSEC.
R-Idl	REAR IDLE ADAP BANK	MSEC
L-Inj	LEF INJECTOR BANK PW	MSEC
F-Inj	FRONT BANK INJ PW	MSEC
R-Inj	RGT INJECTOR BANK PW	MSEC
R-Inj	REAR BANK INJ PW	MSEC
KS v	KNOCK SENSOR VOLTS	VOLTS
Knock	KNOCK SENSOR VOLTS	VOLTS
1 KSv	1 KNOCK SENSOR VOLTS	VOLTS
2 KSv	2 KNOCK SENSOR VOLTS	VOLTS
RS-Ad	REAR SHORT TERM ADAP	%
RL-Ad	REAR LONG TERM ADAP%	%
S-ADP	SHORT TERM ADAPTIVE%	%
L-ADP	LONG TERM ADAPTIVE%	%
CELL (X)	ADAPTIVE MEM CELL (X)	%
L-ADP	LONG TERM ADAPTIVE%	%
L-ADP	LONG TERM ADAPTIVE%	%
FL-Ad	FRONT LONG TERM ADAP%	%
LS-Ad	LEFT SHORT TERM ADAP	%
LL-Ad	LEFT LONG TERM ADAP%	%
LCEL (X)	LEFT ADAP MEM CELL (X)	%
RS-Ad	RGHT SHORT TERM ADAP	%
RL-Ad	RGHT LONG TERM ADAP%	%
RCel (X)	RGHT ADAP MEM CELL (X)	%
FL-Ad	FRNT LONG TERM ADAP%	%
RL-Ad	REAR LONG TERM ADAP%	%
LL-Ad	LEFT LONG TERM ADAP%	%
RL-Ad	RGHT LONG TERM ADAP%	%
FL-Ad	FRNT LONG TERM ADAP%	%
RL-Ad	REAR LONG TERM ADAP%	%
LL-Ad	LEFT LONG TERM ADAP%	%
RL-Ad	RGHT LONG TERM ADAP%	%
O2S	O2 SENSOR VOLTS	VOLTS
S-Adp	SHORT TERM ADAPTIVE%	%
L-Adp	LONG TERM ADAPTIVE%	%
FS-Ad	FRONT SHORT TERM ADP	%
LUO2S	LFT UP O2S BNK VOLTS	VOLTS
F-O2S	FRONT BANK O2S VOLTS	VOLTS
L-O2S	LEFT O2S BANK VOLTS	VOLTS
FCel (X)	FRONT ADAP MEM CEL (X)	%

RUO2S	RGT UP O2S BANK VOLTS	VOLTS
R-O2S	RGHT O2S BANK VOLTS	VOLTS
FUO2S	FRT BNK UP O2S VOLTS	VOLTS
FDN02	F-BNK DWN O2S VOLTS	VOLTS
RUO2S	REAR BNK UP O2S VOLT	VOLTS
RDN02	R-BNK DWN 02S VOLTS	VOLTS
F-02S	FRNT 02S BANK VOLTS	VOLTS
AV-O2	AVERAGE O2 VOLTS	VOLTS
R-O2S	REAR O2S BANK VOLTS	VOLTS
FPFC1	F-PURG FREE IDL-CELL	%
FPFC2	FRT PURG FREE CELL 2	%
FPFC3	FRT PURG FREE CELL 3	%
RPFC1	R-PURG FREE IDL-CELL	%
RPFC2	REAR PURG FREE CEL 2	%
RPFC3	REAR PURG FREE CEL 3	%
U-O2S	UPSTREAM O2S VOLTS	VOLTS
U-O2S	UPSTREAM O2 SENSOR	VOLTS
D-O2S	DOWNSTREAM O2S VOLTS	VOLTS
D-O2S	DOWNSTREAM O2S VOLTS	VOLTS
PRE02	PRE-CAT 02S VOLTS	VOLTS
PST02	POST-CAT 02S VOLTS	VOLTS
LDN02	L-DWN 02S BANK VOLTS	VOLTS
RDN02	R-DWN 02S BANK VOLTS	VOLTS
ST-Ad	SHORT TERM ADAPTIVE%	%
ST-Ad	SHORT TERM ADAPTIVE%	%
RCel(X)	REAR ADAP MEM CELL (X)	%
L-STA	LEF SHORT TERM ADAP%	%
R-STA	RGT SHORT TERM ADAP%	%
F-STA	FRT SHORT TERM ADAP%	%
R-STA	RR SHORT TERM ADAP%	%
VSS	VEHICLE SPEED SENSOR	MPH
T IAC	TARGET IAC STEPS	STEPS
CMP CKP 1 CKP 2	1 TIME CMP EDGE SEEN - LAST CKP EDGE CNT #1 LAST CKP EDGE CNT #2	IGNITION COUNTERS BASED ON CAM A CRANK SENSORS
CMP	CAMSHAFT POS SENSOR	
CMP	CURRENT CMP COUNT	
CKP	CRANKSHAFT POS SEN	
CKP	CURRENT CKP COUNT	
STALL	RUN TIME AT STALL	Min/Secs
LLoop	LEFT CLOSED LP TIMER	
READY	CLOSED LOOP TIMER	Min/Secs
Time	TIME FROM START/RUN	Min/Secs
STALL	RUN TIME AT STALL	Min/Secs
TIME	TIME FROM START/RUN	Min/Secs
Time	TIME FROM START/RUN	Min/Secs
Stall	RUN TIME AT STALL	Min/Secs
READY	CLOSED LOOP TIMER	Min/Secs
TIME	TIME FROM START/RUN	Min/Secs
TIME	TIME FROM START/RUN	Min/Secs

GLOSSARY

RLoop	RGHT CLOSED LP TIMER	
LPFC1	LF PURG FREE IDL-CEL	%
LPFC2	LEF PURG FREE CELL 2	%
LPFC3	LEF PURG FREE CELL 3	%
LPFC4	LEF PURG FREE CELL 4	%
RPFC1	RT PURG FREE IDL-CEL	%
RPFC2	RGT PURG FREE CELL 2	%
RPFC3	RGT PURG FREE CELL 3	%
PF-C1	PURGE FREE IDLE CELL	%
PF-C2	PURGE FREE ADP CEL 2	%
PF-C3	PURGE FREE ADP CEL 3	%
PF-C4	PURGE FREE ADP CEL 4	%
RPF-C4	RGT PURG FREE 4	%
PF-C7	PURGE FREE ADP CEL 7	%
PF-C4	PURGE FREE ADP CEL 4	%
FLoad	FREEZ F LOAD VALUE %	%
F-ECT	FREEZ F ECT DEGREES	DEG F

Short name	Long name	State
A/C 1	DESIRED A/C CLTCH RE	OFF/ON
A/C 2	ACTUAL A/C CLUTCH RE	Control High/Low
A/C	A/C CLUTCH RELAY	OFF/ON
A/C 1	DESIRED A/C CLUTCH RE	OFF/ON
A/C 2	ACTUAL A/C CLUTCH RE	Control High/Low
A/C c	A/C CUTOUT	YES/NO
ConF1	DESIRED CONDENSOR FAN HI	OFF/ON
ConF2	ACTUAL CONDENSOR FAN HI	Control Hi/Low
A/C 1	DESIRED A/C CLUTCH RE	OFF/ON
A/C r	A/C REQUEST INPUT	ALLOWED
A/C r	A/C REQUEST INPUT	OFF-TOO COLD
A/C p	A/C PREDICT	ON/OFF
A/Csw	A/C SWITCH SENSE	OFF/ON
A/CSE	A/C SELECT INPUT	Off
A/CE	A/C SELECT SWITCH	Selected
A/C s	A/C SELECT SWITCH	ON
A/C s	A/C SELECT SWITCH	OFF-2 COLD
A/C s	A/C SELECT SWITCH	ALLOWED
A/C s	A/C SWITCH	OFF
A/CSw	A/C SWITCH INPUT	ON
AirSw	AIR SWITCH SOLENOID	DOWNSTREAM
Air 1	Desired Sec Air Sol	Blocked
Air 2	Actual Sec Air Sol	Control Low
VTSS1	VEH THEFT FUEL STATE	KILL
VTA 1	THEFT FUEL STATE	KILL
KILC1	CURRENT FUEL SHUTOF1	Deceleration
KilC2	CURRENT FUEL SHUTOF2	Torque Mgmt
KILC3	CURRENT FUEL SHUTOF3	Rev Limiter
KILC4	CURRENT FUEL SHUTOF4	Abov 112 MPH
KilH2	HISTORY FUEL SHUTOF2	Torque Mgmt
KilH3	HISTORY FUEL SHUTOF3	Rev Limiter
KILH4	HISTORY FUEL SHUTOF4	Abov 118 MPH
KilC1	CURRENT FUEL SHUTOF1	none
Kil-F	CURRENT FUEL SHUTOFF	Fuel Shutoff
VTSS2	VEH THEFT ALARM SEEN	SEEN
VTA 2	THEFT ALARM SEEN	SEEN
VTSS2	VEH THEFT SEEN STATE	SEEN
Sense	ASD SENSE	LOW
ASD 1	DESIRED ASD RELAY	OFF
ASD	AUTO SHUTDOWN RELAY	OFF
ASD2	ACTUAL ASD RELAY	Control High
B1	B1 CIRCUIT - '89 SMEC BACK UP LOOP CIRCUIT USE FOR IMMEDIATE SPARK ADVANCE DURING A START TO RUN TRANSFER.	RUN
BaroS	BARO READ SOLENOID	VAC/BOOST
GenF1	DESIRED GEN FIELD	OFF
GenF2	ACTUAL GEN FIELD	Control Hi
Brake	BRAKE SWITCH	PRESSED
Loop3	L-O2 UPDATNG ADP MEM	YES
Gen 1	DES GENERATOR FIELD	Full Field
Gen 2	ACT GENERATOR FIELD	Full Field
LDPSw	LEAK DETECT PUMP SW	Closed/Up
LDP 1	DES LEAK DET PUMP SL	Vac Applied
LDP 2	ACT LEAK DET PUMP SL	Control Low
Loop3	O2 UPDATING ADAP MEM	YES
Loop3	F-O2 UPDATNG ADP MEM	YES
Loop4	R-O2 UPDATNG ADP MEM	YES
Cam	CAM SENSOR FLAG	YES
Loop3	O2S UPDATING ADP MEM	YES
LOOP2	FUEL FEEDBACK STATE	CLOSED LOOP
Loop	CLOSED LOOP STATUS	CLOSED LOOP
OpLp1	SUSPENDED CLOS LOOP1	State/DTCs
OpLp2	SUSPENDED CLOS LOOP2	TPS at WOT
OpLp3	SUSPENDED CLOS LOOP3	Part Throttle Enrichment
OpLp4	SUSPENDED CLOS LOOP4	MAP<Minimum
OpLp5	SUSPENDED CLOS LOOP5	Decl Leanout
OpLp6	SUSPENDED CLOS LOOP6	2 O2s Failed
OpLp7	SUSPENDED CLOS LOOP7	1 O2s Failed
LOOP	CLOSED LOOP STATE	READY
LOOP	CLOSED LOOP STATUS	CLOSED LOOP
O2S	O2S UPDATING ADP MEM	NO
Loop	CLOSED LOOP STATE	CLOSED LOOP
Crank	CRANK SENSOR FLAG	YES
Loop	CLOSED LOOP TIMER	READY
State	FUEL FEEDBACK STATE	CLOSED LOOP
O2S	O2S UPDATING ADP MEM	NO
Loop	FUEL CONTROL STATUS	Closed Loop
EGR	EGR SOLENOID	BLOCKED
EGR 1	DESIRED EGR SOLENOID	ALLOWED
EGR 2	ACTUAL EGR SOLENOID	Control High

GLOSSARY

Fuel	FUEL FEEDBACK STATE	CLOSED LOOP
EGR 1	DESIRED EGR SOLENOID	ALLOWED
EGR 2	ACTUAL EGR SOLENOID	Control High
F20	F20 CIRCUIT - 89 SMEC BACK UP LAMP CIRCUIT - USE FOR IMMEDIATE SPARK DURING A START TO RUN TRANSFER.	RUN
FPRB	FUEL PUMP REGISTER BYPASS RELAY - USED FOR JEEP W/NOISY FUEL PUMPS, HELPS QUIET THESE PUMPS DOWN.	FULL VOLTAGE
FP R1	DESIRED FUEL PUMP RE	OFF
FP R2	ACTUAL FUEL PUMP RLY	Control High
FP R1	DESIRED FUEL PUMP RE	OFF
FP R2	ACTUAL FUEL PUMP RLY	Control High
IdlSw	IDLE SWITCH	OPENED
LU-S	LOCKUP SOLENOID	LOCKUP
LU-S	LOCKUP SOLENOID	UNLOCKED
ManT2	ACT MAN TUNE VALVE	CONTROL HI
Man-T	DES MAN TUNE VALVE	OFF
Man-T	MANIFOLD TUNE VALVE	OFF
ODLmp	OVERDRIVE LAMP	OFF/4-ALLOW
ManT1	DESIRED MAN TUNE VLV	OFF
ODLp1	DESIRED O/D OVERDE L	OFF/4-ALLOW
ODLp2	ACTUAL O/D OVERDE LP	Control High
ODLp1	O/D OVERDE LAMP	OFF/4-ALLOW
ManT2	ACTUAL MAN TUNE VALV	OFF
OD-S	OVERDRIVE SOLENOID	3RD
OD-S1	DESIRED O/D SOLENOID	3RD
OD-S2	ACTUAL O/D SOLENOID	Control High
ODLp1	DESIRED O/D OVERDE L	OFF/4-ALLOW
ODLp2	ACTUAL O/D OVERDE LP	CONTROL HIGH
OD Sw	OVERDRIVE SWITCH	RELEASED
P/N P	PARK/NEUTRAL SWITCH	D/R
PS Sw	POWER STEERING SW	OPENED
PS Sw	POWER STEERING SW	HIGH PSI
PS Sw	POWER STEERING SW	LOW PSI
Purge	PURGE SOLENOID	FLOWING
Fan	RADIATOR FAN RELAY	OFF
Cut	S/C CUTOUT	NO
Stat	S/C STATUS	ALLOWED
Vac	S/C VACUUM SOLENOID	BLOCK
VAC 1	DESIRED S/C VAC SOL	BLOCK
Vac 2	ACTUAL S/C VAC SOL	Control High
Vent	S/C VENT SOLENOID	BLEED
VENT1	DESIRED S/C VENT SOL	BLEED
Vent2	ACTUAL S/C VENT SOL	Control High
Vent1	DESIRED S/C VENT SOL	BLEED
SC On	SPEED CONTROL ON/OFF	ON
SCRly	SPEED CONTROL RELAY	OFF
SCRe1	DESIRED S/C CTRL RLY	OFF
SCRe2	ACTUAL S/C CTRL RLY	OFF

Resum	SPEED CONTROL RESUME	PRESSED
Set	SPEED CONTROL SET	RELEASED
Cancl	SPEED CONTROL CANCEL	PRESSED
Decel	SPEED CONTROL DECEL	PRESSED
Sync	SYNC PICK-UP	HIGH
Trans	TRANS TEMP SWITCH	ABOVE 300 F
TTmp1	DESIRED TRANS TMP LP	OFF
TTmp2	ACTUAL TRANS TEMP LP	OFF
TTmp2	ACTUAL TRANS TEMP LP	Control High
TTmp1	TRANS TEMP LAMP	OFF
VNT 1 VNT 2 VNT 3	VNT #1 SOLENOID VNT #2 SOLENOID VNT #3 SOLENOIDENIED	1990 2.2 TURBO IV VARIABLE NOZZLE TURBO VENT SOLENOID
Wait	WAIT TO START	TO START
Wait	WAIT TO START	DONT START
WG-S	WASTEGATE SOLENOID	OFF
Z1	Z1 CIRCUIT - ASD RELAY VOLTAGE SENSE CIRCUIT	HIGH
2-3L	2-3 LOCK OUT LMP	OFF
SkpL1	DESIRED SKIP SHFT LP	OFF
SkpL2	ACTUAL SKIP SHIFT LP	OFF
REV-S	REVERSE LOCK OUT SOL	DISABLED
2-3S	2-3 LOCK OUT SOL	ALL GEARS
SkpS1	DESIRED SKIP SHFT SL	ALL GEARS
SkpS2	ACTUAL SKIP SHIFT SL	ALL GEARS
CMP	CAMSHAFT POS SENSOR	YES
CKP	CRANKSHAFT POS SEN	YES
TCC	TORQUE CONVTR CLUTCH	UNLOCKED
TCC 1	DESIRED TC CLUTCH	UNLOCKED
TCC 2	ACTUAL TC CLUTCH	Control High
P/N P	PARK/NEUTRAL POSIT	D/R
EVAP	EVAP PURGE SOLENOID	FLOWING
EVAP2	ACTUAL EVAP PURGE SL	Control High
EVAP1	DESIRED EVAP PURG SL	FLOWING
EVAP2	ACTUAL EVAP PURGE SL	Blocked
EVAP1	DESIRED EVAP PURG SL	Blocked
FC	RAD FAN CONTROL RLY	OFF
FC 1	DESIRED RAD FAN CTRL	OFF
FC 2	ACTUAL RAD FAN CTRL	Control High
FC 2	ACTUAL RAD FAN CTRL	OFF
LoFC1	DESIRED LOW RAD FAN	On
LoFC2	ACTUAL LOW RAD FAN	Control Lo
HiFC1	DESIRED HIGH RAD FAN	On
HiFC2	ACTUAL HIGH RAD FAN	Control Lo
SC12v	DES S/C 12 VOLT FEED	ON
Hi FC	HI SPEED FAN CTRL RE	OFF
HiFC1	DESIRED HI SPEED FAN	OFF
HiFC2	ACTUAL HI SPEED FAN	OFF
Lo FC	LO SPEED FAN CTRL RE	OFF
LoFC1	DESIRED LO SPEED FAN	OFF

GLOSSARY

LoFC2	ACTUAL LO SPEED FAN	OFF
Hi FC	HI SPEED FAN CTRL RE	ON
HSGR1	DES HI SPD GND RLY	OFF
HSGR2	ACT HI SPD GND RLY	Control High
CMP	CAMSHAFT POS SENSOR	HIGH
SIL	SHIFT INDICATOR LAMP	LIGHT OFF
SIL 1	DESIRED SHIFT IND LP	OFF
SIL2	ACTUAL SHIFT IND LMP	OFF
1HTR1	DESIRED HEATER 1	OFF
2HTR1	ACTUAL HEATER1	OFF
1HTR2	DESIRED HEATER 2	OFF
2HTR2	ACTUAL HEATER 2	OFF
HTR1	INTAKE HEATER1	OFF
HTR2	INTAKE HEATER 2	OFF
C-CMP	CURRENT CMP STATE	CMP Present
C-CKP	CURRENT CKP STATE	CKP Present
C-Syn	CURRENT INSYNC STATE	In Sync.
H-CMP	HISTORY OF CMP	Not Lost
H-CKP	HISTORY OF CKP	Not Lost
H-Syn	HISTORY OF SYNC	Not Lost
C-CMP	CURRENT CMP EDGE	Low
C-CKP	CURRENT CKP STATE	CKP Present
C-CMP	CURRENT CMP EDGE	HIGH
C-Syn	CURRENT INSYNC STATE	In Sync
Limp0	LIMP-IN REASON 0	IAC DTC
LIMP1	LIMP-IN REASON 1	ECT Fault
LIMP2	LIMP-IN REASON 2	MAP Vac Flt
LIMP3	LIMP-IN REASON 3	MAP Ele Flt
LIMP4	LIMP-IN REASON 4	TPS Fault
Limp5	LIMP-IN REASON 5	IAT Fault
Limp1	LIMP-IN REASON 1	ECT DTC
Limp2	LIMP-IN REASON 2	TCC DTC
Limp3	LIMP-IN REASON 3	MAP Elec DTC
Limp4	LIMP-IN REASON 4	TPS DTC
Limp5	LIMP-IN REASON 5	MAP Vac DTC
Limp5	LIMP-IN REASON 5	MAP Vac DTC
ALLOW	S/C ALLOWED	YES
WORK1	S/C WORKING 1	Normal
WORK2	S/C WORKING 2	Accelerating
WORK3	S/C WORKING 3	Decelerating
DENY1	S/C DENIED 1	On/Off Switch
DENY2	S/C DENIED 2	Speed Sensor
DENY3	S/C DENIED 3	RPM Hi Limit
DENY4	S/C DENIED 4	Brake Switch
DENY5	S/C DENIED 5	P/N P Switch
DENY6	S/C DENIED 6	RPM vs Speed
DENY7	S/C DENIED 7	Clutch Sw
DENY8	S/C DENIED 8	Vac/Vent Sol
DENY9	S/C DENIED 9	On/Off Fault
DEN10	S/C DENIED 10	Cancel Sw

DEN11	S/C DENIED 11	TPS Limp-In
CUT1	S/C LAST CUTOUT 1	On-off Switch
CUT2	S/C LAST CUTOUT 2	Speed Sensor
CUT3	S/C LAST CUTOUT 3	RPM Hi Limit
CUT4	S/C LAST CUTOUT 4	Brake Switch
CUT5	S/C LAST CUTOUT 5	P/N P Switch
CUT6	S/C LAST CUTOUT 6	RPM vs Speed
CUT7	S/C LAST CUTOUT 7	Clutch Sw
CUT8	S/C LAST CUTOUT 8	Vac/Vent DTC
CUT9	S/C LAST CUTOUT 9	SBEC Reset
CUT10	S/C LAST CUTOUT 10	On/Off Fault
CUT11	S/C LAST CUTOUT 11	Cancel Sw
CUT12	S/C LAST CUTOUT 12	TPS Limp-In
TM-AM	TSKMGR ACT MIL STATE	On
TM-RM	TSKMGR REQ MIL STATE	On
FFue1	FREEZ F FUEL STATE 1	Open Loop
FFue2	FREEZ F FUEL STATE 2	Closed Loop
FFue3	FREEZ F FUEL STATE 3	O-L/Driving
FFue4	FREEZ F FUEL STATE 4	Op-Lp DTC
FFue5	FREEZ F FUEL STATE 5	Cl-Op/O2-DTC
TM-GT	TASK MGR GOOD TRIP	Yes/No
TM-MF	TSK MGR MIL FLASHING	Yes/No
TM-WO	TSKMGR WARMUP OCUR'D	Yes/No
TM-TO	TSK MGR TRIP OCCURED	Yes/No
TM-MO	TSK MGR REQUESTD MIL	Yes/No
MF-D1	MISFIR TST DONE ONCE	Yes/No
MF-TP	MSFIR TST IN PROGRES	Yes/No
MF-FT	MSFIR FAIL THIS TRIP	Yes/No
MF-F1	MISFIR FAILED 1 TRIP	Yes/No
MF-F2	MSFIR FAIL & DTC SET	Yes/No
CC-D1	CAT TEST DONE ONCE	Yes/No
CC-TP	CAT TEST IN PROGRESS	Yes/No
CC-FT	CAT FAILED THIS TRIP	Yes/No
CC-F1	CAT FAILED 1 TRIP	Yes/No
CC-F2	CAT FAILED & DTC SET	Yes/No
CC-D1	CAT DONE THIS TRIP	Yes/No
O2-D1	UP-O2 TEST DONE ONCE	Yes/No
O2-TP	UP-O2 TEST INPROGRES	Yes/No
O2-FT	UP-O2 FAIL THIS TRIP	Yes/No
O2-F1	UP-O2 FAILED 1 TRIP	Yes/No
O2-F2	UP-O2 FAIL & DTC SET	Yes/No
O2-D1	UP-O2 DONE THIS TRIP	Yes/No
U2HD1	U-HTR TEST DONE ONCE	Yes/No
U2HDP	U-HTR TEST INPROGRES	Yes/No
U2HDT	U-HTR FAIL THIS TRIP	Yes/No
U2HD1	U-HTR FAILED 1 TRIP	Yes/No
U2HD2	U-HTR FAIL & DTC SET	Yes/No
U2HTD	UP02HT DONETHIS TRIP	Yes/No
D2HD1	D-HTR TEST DONE ONCE	Yes/No
D2HTP	D-HTR TEST INPROGRES	Yes/No

GLOSSARY

D2HFT	D-HTR FAIL THIS TRIP	Yes/No
D2HF1	D-HTR FAILED 1 TRIP	Yes/No
D2HF2	D-HTR FAIL & DTC SET	Yes/No
D2HTD	DNO2T DONE THIS TRIP	Yes/No
Ln-D1	LEAN TEST DONE ONCE	Yes/No
Ln-TP	LEAN TEST IN PROGRES	Yes/No
Ln-FT	LEAN FAIL THIS TRIP	Yes/No
Ln-F1	LEAN FAILED 1 TRIP	Yes/No
Ln-F2	LEAN FAIL & DTC SET	Yes/No
Ln-TD	LEAN DONE THIS TRIP	Yes/No
Ri-D1	RICH TEST DONE ONCE	Yes/No
Ri-TP	RICH TEST IN PROGRES	Yes/No
Ri-FT	RICH FAIL THIS TRIP	Yes/No
Ri-F1	RICH FAILED 1 TRIP	Yes/No
Ri-F2	RICH FAIL & DTC SET	Yes/No
Ri-TD	RICH DONE THIS TRIP	Yes/No
EGRD1	EGR TEST DONE ONCE	Yes/No
EGRTP	EGR TEST IN PROGRESS	Yes/No
EGRFT	EGR FAILED THIS TRIP	Yes/No
EGRF1	EGR FAILED 1 TRIP	Yes/No
EGRF2	EGR FAIL & DTC SET	Yes/No
EGRTD	EGR DONE THIS TRIP	Yes/No
PURD1	PURG TEST DONE ONCE	Yes/No
PURTP	PURG TEST IN PROGRES	Yes/No
PURFT	PURGFAILED THIS TRIP	Yes/No
PURF1	PURGFAILED 1 TRIP	Yes/No
PURF2	PURG FAIL & DTC SET	Yes/No
PURTD	PURG DONE THIS TRIP	Yes/No
AIRTD	SECAIR TST DONE ONCE	Yes/No
AIRTP	SECAIR TST INPROGRES	Yes/No
AIRFT	SECAIR FAIL THIS TRP	Yes/No
AIRF1	SECAIR FAILED 1 TRIP	Yes/No
AIRF2	SECAIR FAIL & DTCSET	Yes/No
AIRTD	SECAIR DONE THISTRIP	No/Yes
TASKM	TASK MAN STATUS REG	
CATMN	CAT MONITOR STAT REG	
O2MON	O2 SENSOR STATUS REG	
MISFR	MISFIRE MON STAT REG	
SCAIR	SEC AIR MON STAT REG	
PRGMN	PURGE MON STATUS REG	
FLSYL	FUEL SYS LEAN MON REG	
FLSYH	FUEL SYS RICH MON REG	
ICELM	ADAP FEUL CTRL CEL14	
ICELA	ADAP FEUL CTRL CEL15	
CRELP	CAM REL POS EEPROM	
BIT00	INPT ST SPD CTL BIT0	
DFWFB	FUEL SYS MON FEEDBCK	
DFBLT	FUEL SYS MON LEAN TM	
DFBLT	FUEL SYS MON RICH TM	
DOBAC	O2MONITOR TIMER	

DCBRD	CAT MON OPEN THROT T
EDVTI	EGR MONITOR TEST TIM
DUTCY	DUTY CYCLE DC PURGE
UO2HT	O2 HEAT UPSTREAM ST
DO2HT	O2 HEAT DWNSTREAM ST
EGRMN	EGR MONITOR STAT REG
EDVOC	O2 CNTRL START TEST
EDVOC	MAX O2 CTRL STRT TST
ASLCT	ACC DAT SLOP CNT MSB
SLCT1	ACC DAT SLOP CNT LSB
ACYCT	ACC DAT CYCLE COUNT
UPSSW	CAT MON UPSTRM O2MSB
UPSW1	CAT MON UPSTRM O2LSB
UPSW2	CAT MON DNSTRM O2MSB
UPSW3	CAT MON DNSTRM O2LSB
AVMP1	PURG FREE MAP VALUE
AVMP2	PURG MON PURGE VALUE
FAULT	PURG MON FALUT COUNT
HISWP	O2 LEAN-RICH TRANS P
CATMF	CAT TEST MISFIRE CNT
FTPMF	FTP TST MISFIRE CNT
CATCT	CAT TEST 200 REV CNT
FTPCT	FTP TEST 200 REV CNT
IGN14	ADAP IGN PERD NU MDB
IG141	ADAP IGN PERD NUM
IG142	ADAP IGN PERD NUM
IG143	ADAP IGN PERD NU LSB
DCTR	DOWN O2FLT H/L VOL
BBAIR	SEC AIR STAT FLG REG
2WFZ	FREEZE FAULT ID DTC
2WFZ1	FREEZE FUEL SYS STAT
2WFZ2	FREEZE CALC LOAD VAL
2WFZ3	FREEZE ENG COOL TEMP
2WFZ4	FREEZE SHRT TRM BNK1
2WFZ5	FREEZE LONG TRM BNK1
2WFZ6	FREEZE SHRT TRM BNK2
2WFZ7	FREEZE LONG TRM BNK2
2WFZ8	FREEZE MANIFOLD PRES
2WFZ9	FREEZE FRM ENG SPEED
2WFZA	FREEZE VEHICLE SPEED
LPPM2	LIMP-IN STAT REG 2
LPPM3	LIMP-IN STAT REG 3
LPMOD	LIMP-IN STAT REG $73

NOTES

NOTES

NOTES

NOTES

NOTES

TRAINING CENTERS

Technical Service Training is offered year-round, tuition-free, at these Chrysler Corporation Training Centers. The Centers are designed to advance the technical knowledge of Chrysler Corporation authorized Dealers and their personnel. Employees from Fleet Accounts, Municipal and Government Agencies are invited also.

All technical courses are conducted by professional Automotive Service Training instructors using the latest training methods. Courses cover disassembly, assembly, diagnosis, and problem-solving techniques on each subject.

All Chrysler Corporation Dealers are furnished schedules, available through the DIAL system, showing courses offered at the Training Centers. For more information, use the list below for the Training Center nearest you.

EASTERN REGION

NEW YORK
(Regional Training Center)
108 Route #303
Tappan, NY 10983-1508

ATLANTA
(Zone Training Center)
Bailey Park at Barrett, Bldg. 300
1000 Cobb Place Blvd., Suite 370
Kennesaw, GA 30144-3685

BOSTON
(Zone Training Center)
105 Forbes Blvd.
Mansfield, MA 02048

CHARLOTTE
(Zone Training Center)
5009-C West W.T. Harris Blvd.
Charlotte, NC 28269-1861

ORLANDO
(Zone Training Center)
8351 Parkline Blvd., Suite 500
Orlando, FL 32809-7866

PHILADELPHIA
(Zone Training Center)
42 Lee Blvd.
Malvern, PA 19355-1235

PITTSBURGH
(Zone Training Center)
203 Overlook Dr.
Sewickley, PA 15143-2305

RICHMOND
(Zone Training Center)
1011 Technology Park Drive
Virginia Center
Glen Allen, VA 23060-4500

ROCHESTER
(Zone Training Center)
245 Summit Point Dr., Suite 1
Henrietta, NY 14467-9606

CENTRAL REGION

DETROIT
(Regional Training Center)
26001 Lawrence Ave.
Center Line, MI 48015-0612

CHICAGO
(Zone Training Center)
1980 Highgrove Lane
Naperville, IL 60540-3934

CINCINNATI
(Zone Training Center)
Enterprise Business Park
2828 E. Kemper Road
Cincinnati, OH 45241-1820

KANSAS CITY
(Zone Training Center)
Lenexa Industrial Park
13253 West 98th Street
Lenexa, KS 66215-1360

MINNEAPOLIS
(Zone Training Center)
Plymouth Oak Park
12800 Highway 55
Minneapolis, MN 55441-3840

ST. LOUIS
(Zone Training Center)
5790 Campus Drive
Hazelwood, MO 63042-2386

NEW ORLEANS
(Zone Training Center)
114 North Park Blvd., Suite 11
Covington, LA 70433-5002

MEMPHIS
(Zone Training Center)
1680 Century Center, Suite 8
Memphis, TN 38134-8849

MILWAUKEE
(Zone Training Center)
700 Walnut Ridge Drive, Suite 100
Hartland, WI 53029-9385

WESTERN REGION

LOS ANGELES
(Regional Training Center)
5141 Santa Ana Street, Suite B
Ontario, CA 91761-8633

DALLAS
(Zone Training Center)
8304 Esters Road, Suite 810
Irving, TX 75063-2234

DENVER
(Zone Training Center)
7022 S. Revere Parkway
Englewood, CO 80112-3932

HOUSTON
(Zone Training Center)
500 Century Plaza Dr., Suite 110
Houston, TX 77073-6027

PHOENIX
(Zone Training Center)
3421 East Harbour Dr. - Suite 300
Phoenix, AZ 85034-7229

PORTLAND
(Zone Training Center)
16145 S.W. 72nd Ave.
Portland, OR 97224-7743

SAN FRANCISCO
(Zone Training Center)
5720 Stoneridge Dr., Suite 1
Pleasanton, CA 94588

7/29/96

WE ENCOURAGE
PROFESSIONALISM

THROUGH TECHNICIAN
CERTIFICATION

TRAINING PROGRAM DEVELOPMENT DEPARTMENT

81-699-95093 1.5M196 LITHO IN U.S.A.